INDUCTIVE LOGIC

A Thematic Compilation

Avi Sion, Ph.D.

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Geneva, Switzerland.

www.TheLogician.net
avi-sion@thelogician.net

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Abstract

Inductive Logic is a 'thematic compilation' by Avi Sion. It collects in one volume many (though not all) of the essays, that he has written on this subject over a period of some 23 years, which all demonstrate the possibility and conditions of validity of human knowledge, the utility and reliability of human cognitive means when properly used, contrary to the skeptical assumptions that are nowadays fashionable.

This volume includes essays on the laws of thought, credibility, logical modality, contextuality, adduction, theory formation and selection, induction of actual and modal propositions, factorial induction (factor selection and formula revision), the phenomenological approach, experience, conceptualization, generalization and particularization, causation and its determinations, volition (freewill) and influences thereon, negation, and existential import.

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Foreword

Rationalism and empiricism are not at odds; but, on the contrary, deeply mutually dependent. True rationalism is firmly grounded in experience; and true empiricism is made possible by application of reason. Induction is the methodological bridge between experience and reason.

Most of my logic and philosophy work through the years has been directly or indirectly about induction. For that reason, and in view of the large volume of my work, it would be impossible for me to collect my writings on induction in one volume. This is why I have long hesitated to produce a 'thematic compilation' on inductive logic.

However, having remained painfully aware of readers' need for a relatively short book on the subject, I have decided to collect a number of essays in the present volume. Obviously, this book cannot reproduce the very detailed work to be found in my books, especially in *Future Logic* and *The Logic of Causation*; but it provides readers with some introductory and conclusive material to chew on. Those interested enough will then hopefully push their research further, and read those larger studies.

Even so, I must stress that the technical details given in my major studies are essential to full understanding and conviction of inductive logic. It is the *formal* details that really make up and teach inductive logic; the surrounding *informal* introductions and conclusions cannot replace them. So, the present volume, while not a mere 'teaser', should certainly not be viewed as constituting my entire work on induction. Very important material had to be left out here, just to save space.[1]

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1 Among the significant segments I had to leave out are the following. From *Future Logic*, I left out: most of the deductive logic work (which is, of course, essential to, and arguably a part of, the inductive logic work); all of the more detailed work on factorial analysis, factor selection and formula revision (although this is, of course, the heart of formal inductive logic); and my comments on the history of inductive logic. From *The Logic of Causation*, I left out most of the formal work,

One cannot sufficiently stress the importance of formal inductive logic to the elaboration of a realistic theory of knowledge. People, still nowadays, think of ‘formal logic’ as essentially a deductive enterprise. This is due in part to the historic fact that the science of logic was kicked off by Aristotle’s marvelous work on the syllogism. But it is also largely due to the almost exclusive focus on deductive logic by most modern logicians.

Modern deductive ‘logicians’ seem to have been, and to still be, inane wankers (excuse the graphic expression) trying to get a name for themselves in academe and in history by reshuffling simplistic symbols *ad nauseum*, without being able to step back and view *the actual ways and means of human knowledge acquisition* with a fresh look and an open mind. In truth, deduction is only a fraction of man’s intellectual work; his main instrument of knowledge is induction. Deduction is only one of the tools of induction, the easiest tool to master (nonetheless, it is essential, of course). Man’s mind is essentially inductive in its functioning, and could not be anything else.

Induction implies knowledge that is, for the most part, if not entirely, approximate and temporary. This is the first and basic lesson of inductive logic, that we must accept our cognitive limitations. It is no use looking for means to an absolute and definitive body of knowledge; and it is absurd (self-contradictory) to reject human knowledge due to its relativity and non-finality. We are not gods – just human beings, just sophisticated animals, doing our best to survive on our little planet, which is a mere speck of dust in an enormous universe.

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and could only include the initial definitions of the determinations of causation (which are of course formal and essential) and the concluding ‘insights’ of the three phases of my research. I was also forced to leave out my critical essays, published in *Logical and Spiritual Reflections*, on Hempel's ‘paradox of confirmation’ and Goodman’s ‘paradox of prediction’, both of course directly relevant to inductive logic. I also wanted to leave out the essay, first published in *A Fortiori Logic*, on the ‘existential import’ doctrine, because most of it relates to deductive logic; but decided that its conclusions are so relevant to inductive logic that I had to keep it in.

Many logicians and philosophers seem unable to accept this simple, primary fact.

The good news is that inductive logic, if properly practiced, can, at all times, provide us with *the very best* 'approximate and temporary' knowledge. We can never honestly claim to possess the final truth on any subject; but we can certainly claim to have chosen the best hypothesis among the currently imagined ones, thanks to inductive logic. This is the great gift of inductive logic, its power.

But note that induction is not an invention of logicians; it is man's instinctive cognitive heritage. Logicians only uncover what mankind has naturally, always, from cradle to grave, from the cave to space travel, practiced to varying degrees, and been aware of more or less clearly. The science of inductive logic is itself a product of inductive practice, and not some externally-imposed, artificial system. Its value lies in theoretically justifying and improving practice.

Inductive logic can be summarized in one sentence that I refer to as ***the principle of induction***, and identify as the fourth law of thought. This has many formulations, depending on the context to which it is applied; listed below are some of its guises. What is common to all of them, notice, is the conjunction of a positive clause and a negative one. The phrase 'until and unless' (or 'until if ever') is essential to all of them, stressing that induction is never definitive but always open to revision.

*The basic principle of generalization is to assume observed, particular uniformities to be applicable generally, **until and unless** we have reason to think otherwise.*

…

*The experiences of similarity or difference are phenomenal, and are taken at face value, **until and unless** otherwise proven, like all other experiences.*

Future Logic (1990).

This is a generalization, an inductive act which upgrades an indefinite particular (I) to a universal of the same polarity (A), ***until if ever*** *evidence is found to the contrary.*

Judaic Logic (1995).

Inductively, appearance implies reality, ***until and unless*** *it is judged to be illusion (by virtue of some inconsistency being discovered).*

Buddhist Illogic (2002).

We consider concepts or propositions compatible, ***until and unless*** *we find some incompatibility between them. (We do not 'prove consistency' but rather 'find inconsistencies'.)*

…

We do not need an epistemological 'axiom' to defend sensation and memory as universally reliable. It suffices to consider the products of these faculties as true, ***until and unless*** *found false.*

Phenomenology (2003).

The proposition "If X is followed by Y, then X causes Y" may logically be assumed to be true, especially if the X+Y combination is repeatedly found to occur, ***until and unless*** *it is found that X is sometimes not followed by Y.*

…

*Thus, the right-wrong or good-bad experiences at the ground of ethics are technically akin to the true-false or correct-incorrect experiences at the ground of non-ethical knowledge. The procedure for judging them is the same: we grant them some ab initio credibility, but reserve our final judgment till further research has confirmed them in all respects (***until and unless*** *new evidence or arguments emerge to the contrary).*

Volition and Allied Causal Concepts (2003).

One may credibly assume something that appears to be real is indeed real, ***until and unless*** *it is proved illusory or at least put in doubt for some specific reason.*

Ruminations (2005).

In accord with general rules of induction, we presume any two items P and Q to be without causative relation, ***until if ever*** *we can establish inductively or deductively that a causative relation obtains between them.*

…

We must obviously usually resort to generalization: having searched for and never found such conjunction, we may reasonably – ***until and unless*** *later discoveries suggest the contrary – assume that such conjunction is in fact impossible.*

The Logic of Causation (2010).

The principle of induction: *given any appearance, we may take it to be real,* ***until and unless*** *it is found to be illusory.*

Logical and Spiritual Reflections (2008).

In accord with the principle of induction, we treat a hypothetical term as a realistic term, ***until and unless*** *we have reason to believe otherwise.*

A Fortiori Logic (2013).

1. THE LAWS OF THOUGHT

Drawn from Future Logic (1990), Chapter 2.

Logic is founded on certain 'laws of thought', which were first formulated by Aristotle, an ancient Greek philosopher. We shall describe them separately here, and later consider their collective significance.

1. The Law of Identity

The Law of Identity is an imperative that we consider all evidence at its face value, to begin with. Aristotle expressed this first law of thought by saying 'A is A', meaning 'whatever is, is whatever it is'.

There are three ways we look upon phenomena, the things which appear before us, however they happen to do so: at their face value, and as real or illusory.

We can be sure of every appearance, that it is, and is what it is. (i) *Something* has presented itself to us, whether we thereafter judge it real or illusory, and (ii) this something displays *a certain configuration*, whether we thereafter describe and interpret it rightly or wrongly. The present is present, the absent is absent.

Every appearance as such is objectively given and has a certain content or specificity. We can and should and commonly do initially regard it with a simple attitude of receptiveness and attention to detail. Every appearance is in itself neutral; the qualification of an appearance (thus broadly defined) as a 'reality' or an 'illusion', is a subsequent issue.

That statement is only an admission that any phenomenon minimally exists and has given characteristics, *without making claims about the source and significance* of this existence or these characteristics. The moment we manage to *but think* of something, it is already at least 'apparent'. No assumption need be made at this stage about the nature of being and knowledge

in general, nor any detailed categorizations, descriptions or explanations of them.

Regarded in this way, at their face value, *all* phenomena are evident data, to be at least taken into consideration. The world of appearances thus offers us *something to work with, some reliable data* with which we can build the edifice of knowledge, a starting point of sorts. We need make no distinctions such as those between the physical/material and the mental, or sense-data and hallucinations, or concrete percepts and abstract concepts; these are later developments.

The law of identity is thus merely an acknowledgement of the world of appearances, without prejudice as to its ultimate value. It defines ‘the world’ *so broadly*, that there is no way to counter it with any other ‘world’. When we lay claim to another ‘world’, we *merely expand* this one. All we can ever do is subdivide the world of appearances into two domains, one of ‘reality’ and one of ‘illusion’; but these domains *can never abolish* each other’s existence and content.

What needs to be grasped here is that every judgment implies the acceptance, at some stage, of some sort of appearance as real. There is no escape from that; to claim that nothing is real, is to claim that the appearance that ‘everything is illusory’ is real. We are first of all observers, and only thereafter can we be judges.

Reality and illusion are simply terms more loaded with meaning than appearance or phenomenon — they imply an evaluation to have taken place. This value-judgement is a final characterization of the object, requiring a more complex process, a reflection. It implies we went beyond the immediately apparent. It implies a broader perspective, more empirical research, more rigorous reasoning. But what we finally have is still ‘appearance’, though in a less pejorative sense than initially.

Thus, ‘real’ or ‘illusory’ are themselves always, ultimately, just appearances. They are themselves, like the objects of consciousness which they evaluate, distinct objects of consciousness. We could say that, there is a bit of the real in the illusory and a bit of the illusory in the real; what they have something in common is appearance. However, these terms lose their meaning if we try to equate them too seriously.

On what basis an appearance may or should be classified as real or illusory is of course a big issue, which needs to be addressed. That is the overall task of logic, to set precise guidelines for such classification. But the first step is to admit the available evidence, the phenomenal world as such: this gives us a database.

2. The Law of Contradiction

The Law of Contradiction [i.e. about Contradiction; or better, of Non-Contradiction] is an imperative to reject as illusory and not real, any apparent presence together of contradictories. This second law of thought could be stated as ‘Nothing is both A and not-A’, or ‘whatever is, is not whatever it is not’.

We cannot say of anything that it is *both* present and absent at once: *what is present, is not absent*. If the world of appearance displays some content with an identity, then it has effectively failed to display nothing. Contradictory appearances cannot coexist, concur, overlap: they are ‘incompatible extremes’.

We can say of something that it ‘is’ something else, in the sense of having a certain relation to something distinct from itself, but we cannot say of it that it both has and lacks that relation, in one and the same respect, at one and the same place and time.

It is evident, and therefore incontrovertible (by the previous law), that appearances are variegated, changing, and diverse. Phenomena have a variety of aspects and are usually composed of different elements, they often change, and differ from each other in many ways. However, for any respect, place and time, we pinpoint, the appearance as such is, and is whatever it is — *and not at once otherwise.*

The law of contradiction is not a mere rephrasing of the law of identity, note well, but goes one step further: it sets a standard for relegating some appearances to the status of illusions; in a sense, it begins to define what we mean by ‘illusion’. It does not, however, thereby claim that all what is leftover in the field of appearance is real with finality; nor does it deny that some of the leftovers are real (as is assured us by the law of identity).

By the law of identity, whatever appears is *given some credence*: therefore, one might suggest, the coexistence of opposites has some credence. The law of contradiction interposes itself at this point, and says: no, such events *carry no conviction* for us, once clearly discerned. The first law continues to function as a recognition that there is an apparent contradiction; but the second law imposes on us the need to resolve that contradiction somehow.

The law of contradiction is itself, like anything else, an appearance among others, but it strikes us as an *especially credible* one, capable of overriding the initial credibility of all other considerations. It does not conflict with the message of the law of identity, since the latter is open to any event, including the event that some appearances be more forceful than others. The law of contradiction is precisely one such forceful appearance, an extremely forceful one.

Thus, though the world of appearances presents itself to us with some seeming contradictions, they appear *as* incredible puzzles — their unacceptability is inherent to them, obvious to us. We may verbally speculate about a world with real contradictions, and say that this position is consistent with itself even if inconsistent with itself. But the fact remains that whenever we are face to face with a specific contradiction (including that one) we are unavoidably skeptical — something seems 'wrong'.

The way we understand the apparent existence of contradictions is by viewing the world of appearances as *layered*, or stratified. Our first impressions of things are often superficial; as our experience grows, our consciousness penetrates *more deeply* into them. Thus, though each level is what it is (law of identity), parallel levels may be in contradiction; when a contradiction occurs, it is because we are superimposing different layers (law of contradiction). In this way, we resolve the 'general contradiction' of contradiction as such — we separate the conflicting elements from each other.

(Note in passing, as an alternative to the metaphor of 'depth', which likens consciousness to a beam of light, we also sometimes refer to 'height'. Here, the suggestion is that the

essence of things is more elevated, and we have to raise ourselves up to make contact with it.)

That resolution of contradiction refers to the diversity and change in the world of appearance as due to the perspectives of consciousness. Thus, the appearance of the phenomena we classified as ‘illusory’ is due to the limitations of ordinary consciousness, its failure to know everything. This restriction in the power of consciousness may be viewed as a ‘fault’ of our minds, and in that sense ‘illusion’ is a ‘product’ of our minds. For that reason, we regard the illusory as in some sense ‘imaginary’ — this is our explanation of it.

On a more objective plane, we may of course accept diversity and change as real enough, and explain them with reference to the space and time dimensions, or to uniform and unchanging essences. In such cases, we are able to meet the demands of the law of contradiction without using the concept of ‘illusion’; only when space, time, and respect, are clearly specified, does a contradiction signify illusion.

3. The Law of the Excluded Middle

The Law of the Excluded Middle is an imperative to reject as illusory and not real, any apparent absence together of contradictories. This third law of thought could be stated as ‘nothing is neither A nor not-A’, or ‘whatever is, either is some thing or is-not that thing’.

We cannot say of anything that it is at once neither present nor absent: *what is not present, is absent*. If the world of appearance fails to display some content with an identity, then it has effectively displayed nothing. There is no third alternative to these two events (whence the expression ‘excluded middle’): they are exhaustive.

We may well say that some parts or aspects of the world are inaccessible to our limited faculties, but (as pointed out in the discussion of identity) we cannot claim a world beyond that of appearances: the moment we mention it, we include it.

It may be that we neither know that something is so and so, nor know that it is not so and so, but this concerns knowledge only,

and in reality that thing either is or is-not so and so. Whatever we consider must either be there or not-there, in the specified respect, place and time, even if we cannot discern things enough to tell at this time or ever. There is an answer to every meaningful question; uncertainty is a 'state of mind', without 'objective' equivalent.

Moreover, *strictly speaking*, 'questions' are artificial attempts to anticipate undisplayed layers of appearance. As things appear now, if nothing is being displayed, *that* is the (current) 'answer' of the world of appearances; in the world of appearances there are no 'questions'. 'Questions' merely express our resolve to pursue the matter further, and try to uncover other layers of appearance; they are not statements about reality.

If we choose to, *loosely speaking*, regard doubts as kinds of assertions, the law of the excluded middle enjoins us to class them at the outset as illusory, and admit that in reality things are definite. Problematic statements like 'it might or might not be thus' are not intended to affirm that 'neither thus nor not-thus' *appeared*, but that what did appear (whether it was 'thus' or 'not-thus' — one of them did, for sure) was not sufficiently forceful to satisfy our curiosity.

Even if no phenomenon is encountered which confirms or discredits an idea, there must be a phenomenon capable of doing so, in the world somewhere, sometime. We have to focus on the evidence, and try and distinguish the appearance or nonappearance of that imagined phenomenon.

Thus, the law of the excluded middle serves to create a breach of sorts between the 'objective world' and the 'world of ideas', and establishes the pre-eminence of the former over the latter. The breach is not an unbridgeable gap, but allows us to expand our language, in such a way that we can discuss eventual layers of appearance besides those so far encountered, even while we admit of the evidence at hand.

Such an artifice is made possible by our general awareness from past experience that appearances do change in *some* cases, but should not be taken to mean that any given appearance *will* change. It is only the expression of a (commendable) 'open-

mindedness' *in principle*, with no specific justification in any given case.

What we have done, effectively, is to expand what we mean by 'appearance', so as to include future appearance, in addition to appearances until now in evidence. Thus far, our implicit understanding was that appearance was *actual*, including present realities and present illusions. Now, we reflect further, and decide to embrace our anticipations of *'possible'* appearances as a kind of actuality, too.

Such hypothetical projections are also, in a sense, 'apparent'. But they are clearly imaginary, inventions of the mind. Their status as appearances is therefore immediately that of 'illusions'; that is their present status, whatever their future outcome. However, they are illusory with less finality than the phenomena so labeled by the law of contradiction; they retain some degree of credibility.

2. CREDIBILITY

Drawn from Future Logic (1990), Chapter 20:1-3.

1. Ground of the Laws

We began our study by presenting the laws of thought — the Laws of Identity, of Contradiction, and of the Excluded Middle — as the foundations of logic. We can see, as we proceed, that these first principles are repeatedly appealed to in reasoning and validation processes. But in what sense are they 'laws'?

a. Many logicians have been tempted to compare these laws to the *axioms* of geometry, or the top postulates of natural sciences. According to this view, they are self-consistent hypotheses, which however are incapable of ultimate proof, from which all other propositions of logic are derived.

There is some truth to this view, but it is inaccurate on many counts. The whole concept of 'systematization' of knowledge, ordering it into axioms and derivatives, is itself a device developed and validated by the science of logic. It is only *ex post facto* that we can order the information provided by logic in this way; we cannot appeal to it without circularity. If logic was based on so tenuous a foundation, we could design alternative logics (and some indeed have tried), just as Euclidean geometry or Newtonian mechanics were replaced by others.

Logic is prior to methodology. The idea that something may be 'derived' from something else, depends for its credibility on the insights provided by the 'laws of thought'. The 'laws of thought' ought not to be viewed as general principles which are *applied* to particular cases, because the process of application itself depends on them.

Rather, we must view *every particular occurrence* of identity, contradiction, and excluded-middle, as *by itself compelling*, an irreducible primary independently of any appeal to large principles. The principles are then merely statements to remind us *that* this compulsion occurs; they are not its source. This

means that the 'laws of thought' are not general principles in the normal sense, but recognitions that 'there are such events'. The science of logic is, then, not a systematic application of certain axioms, but *a record of the kind of events which have this compelling character* for us.

Note this well. *Each* occurrence of such events is self-sufficiently evident; it is only thereafter that we can formulate statements about 'all' these events. We do not know what to include under the 'all' beforehand, so how could we 'apply' the laws to anything? These laws cannot be strictly-speaking 'generalizations', since generalization presupposes that you have some prior data *to* generalize.

Thus, we must admit that *first* comes specific events of identity, contradiction and excluded-middle, with a force of their own, then we can say 'these and those are *the kinds of* situations' where we experience that utter certainty, and only lastly can we *loosely-speaking* format the information in the way of axioms and derivatives.

Nevertheless, it remains true that the laws of thought have a compelling character on their own. There is no way to put these laws in doubt, without implicitly arousing doubt in one's own claim. Sophisms always conceal their own implications, and tacitly appeal to the laws of thought for support, to gain our credulity. We could, therefore, equally say that the principles as units in themselves are entirely convincing, with utter finality — provided we *also* say that every act of their 'application' is likewise indubitable. It comes to the same.

However, the previous position is more accurate, because it explains how people unversed in the laws of thought, can nonetheless think quite logically — and also how we can understand the arguments here made about the laws of thought. The inconsistency of denials of the laws of thought is one instance of those laws, and not their whole basis.

b. What, then, is this 'compulsion' that we have mentioned? It is evident that people are not forced to think logically, say like physical bodies are forced to behave in certain ways. This is given: we do make errors, and these sometimes seem 'voluntary', and sometimes accidental. In any case, if

thought was a mechanistic phenomenon, we would have no need of logical guidelines. We may only at best claim that we *can and should, and sometimes do*, think in perfect accord with these laws.

The answer to this question was implicit in the above discussion. It is or seems evident that things do present themselves and that they do have certain contents (identity), and that these presentations are distinct from their absences (contradiction), and that there is nothing else to refer to (excluded-middle). Because these statements concern appearances as such, it is irrelevant whether we say ‘it *is* evident’ or ‘it *seems* evident’.

The concepts of reality and appearance are identical, with regard to the phenomenal; the concept of illusion is only meaningful as a subdivision of the phenomenal. These laws are therefore *always* evident, whether we are dealing with realities or illusions. We can wrongly interpret or deliberately lie about what we ‘see’ (if anything), but *that* we ‘saw’ and *just what* we ‘saw’ is pure data. Thus, the ‘compulsion’ is presented to us an intrinsic component of the phenomenal world we face.

The practical significance of this can be brought out with reference to the law of contradiction. We are saying, in effect, that whatever seems contradictory, is so. This statement may surprise, since we sometimes ‘change our minds’ about contradictions.

To understand it, consider two phenomena, say P1 and P2, in apparent contradiction, call this C1. One way to resolve C1, is to say that one or both of P1 and P2 are illusory. But we might find, upon closer inspection, that the two phenomena are not in contradiction; call this noncontradiction C2. So, we now have two new phenomena, C1 and C2, in apparent contradiction; call this new contradiction C3.

The question is, does C3 imply that one or both of C1 and C2 are illusory? The answer is, no — what happened ‘upon closer inspection’ was not a revision of C1, but a revision of P1 and/or P2. So that in fact C2 does not concern exactly the same phenomena P1 and P2, but a slightly different pair of phenomena with the same names.

Thus, C1 and C2 could never be called illusory (except loosely speaking), because they were never in conflict, because they do not relate the same pair of phenomena. Nor for that matter may C3 be viewed as now erroneous, because the pair of phenomena it, in turn, related have changed.

Which means that our 'intuition' of contradiction is invariably correct, *for exactly the data provided* to it. A similar argument can be made with regard to other logical relations. The phenomena related may be unclear and we may confuse phenomena (thinking them the same when they are different) — but, at any level of appearance, the logical relation between phenomena is 'compulsively evident', inflexibly fixed, *given*.

In other words, *among phenomena, logical relations are one kind which are always real*; in their case, appearance and reality are one and the same, and there are no illusions. The laws of thought are presented as imperatives, to urge us to focus on and carefully scrutinize *the phenomena related*, and not to suggest that the *logical* intuitions of thought are fallible, once the effort is made to discern the relation.

This is not a claim to any prior omniscience, but a case by case accuracy. As each situation arises, its logical aspects are manifest to the degree that we inspect things clearly. Note well, we do not need to know *how* the intuition functions, to be able to know and prove *that* it functions well. We have called it 'intuition' to suggest that it is a direct kind of consciousness, which may well be conceptual rather than perceptual, but these descriptive issues are secondary.

Thus, with regard to the laws of thought, we have no ground for wondering whether they are animal instincts imposed by the structure of the mind, or for wondering whether they control the events external to it as well. In either case, we would be suggesting that there is a chance that they might be illusory and not real. If we claim that the mind is distortive, one way or the other, we put that very claim in doubt.

The mind is doubtless limited. It is common knowledge that mental conditions, structural or psychological or voluntary, can *inhibit* us from comparing phenomena with a view to their

logical relation — but that does not mean that when the elements *are* brought together, the comparison may fail.

Nervous system malfunctions, personality disorders, drunkenness, fatigue — such things can only arrest, never alter these intuitions. As for evasions and lies, we may delude ourselves or others, to justify some behavior or through attachment to a dogma — but these are after the fact interventions.

2. Functions of the Laws

The laws of thought relate to the credibility, or trustworthiness, of phenomena. They clarify things in three stages. At the identity level, appearances are acknowledged and taken as a data base. At the contradiction level, we learn to discriminate clearly between real and illusory appearances. At the excluded-middle level, we introduce a more tempered outlook, without however ignoring the previous lessons. More specifically, their functions are as follows:

The first law assigns a minimal credibility to any thought whatsoever, if only momentarily; the evidence, such as it is, is considered. If, however, the 'thought' is found to consist of meaningless words, or is overly vague or obscure — it is as if nothing has appeared, and credibility disappears (until and unless some improvement is made). To the extent that a thought has some meaning, precision, and clarity, it retains some credibility.

The second law puts in doubt any thoughts which somehow give rise to contradictions, and thereby somewhat enhances the credibility of all thoughts which pass this test. In the case of a thought which is self-inconsistent (whether as a whole or through the conflicts of its parts), its credibility falls to zero, and the credibility of denial becomes extreme. In the case of two or more thoughts, each of which is self-consistent, but which are incompatible with each other, the loss of credibility is collective, and so individually less final.

The third law sets bounds for any leftover thoughts (those with more than zero and less than total credibility, according to the

previous two laws): if special ways be found to increase or decrease their credibilities, the overall results cannot in any case be such as to transgress the excluded-middle requirement (as well as the no-contradiction requirement, of course). As we shall see, the processes of confirmation and discrediting of hypotheses are ways logic uses to further specify credibilities.

We see that, essentially, the law of identity gives credence to *experience*, in the widest sense, including concrete perceptions and abstract conceptual insights. The law of contradiction essentially justifies the logical intuitions of *reason*. The law of the excluded-middle is essentially directed at the projections of the *imagination*. This division of labor is not exclusive — all three laws come into play at every stage — but it has some pertinence.

The credibility of a phenomenon is, then, a measure of how well it fits into the total picture presented by the world of appearances; it is a component of phenomena, like bodies have weight. This property is in some cases fixed; but in most cases, variable — an outcome of the interactions of phenomena as such.

The laws of thought are, however, only the first steps in a study of credibility. The enterprise called logic is a continual search for additional or subsidiary norms. Logic theory develops, as we shall see, by considering various kinds of situations, and predicting the sorts of inferences which are feasible in each setting.

More broadly the whole of philosophy and science may be viewed as providing us with more or less rough and ready, practical yardsticks for determining the relative credibility of phenomena. However, such norms are not of direct interest to the logician, and are for him (relatively speaking) specific world views. Logic has to make do with the two broadest categories of reality and illusion — at least, to begin with.

3. More on Credibility

Every phenomenon appears to us with some degree of *'credibility'*, as an inherent component of its appearance; this is

an expression of the law of identity. That initially intuitive credibility may be annulled or made extreme, through the law of contradiction; or it may be incrementally increased or decreased, by various techniques (yet to be shown), within the confines of the laws of contradiction and of the excluded middle.

Thus, credibility is primarily an aspect of the phenomenal world, and a specific phenomenon's degree of credibility is a function of what other phenomena are present in the world of appearances at that stage in its development. Because phenomena interact in this way, and affect each other's credibilities, credibility may be viewed as a measure of how well or badly any phenomenon 'fits in' with the rest.

'Reality' and 'illusion' are just the extremes of credibility and incredibility, respectively; they are phenomena with that special character of total or zero force of conviction. We cannot refer to a domain beyond that of appearances, for good or bad, without thereby including it within the world of appearances.

How do we know that all appearances must ultimately be real or illusory? How do we know that *median* credibility cannot be a permanent state of affairs in some cases, on a par with the extremes of credibility and incredibility? We answered this question, in broad terms, in our discussions on the laws of thought, as follows. More will be said about it as we proceed.

Reality and illusion are a dichotomy of actual appearances: for them, whatever is inconsistent is illusory, and everything else is real enough. Median credibility only comes into play when we try to anticipate future appearances, but has no equivalent in the given world. In the actual field of concrete and abstract experiences, things have either no credibility or effectively total credibility; it is only through the artificial dimension of mental projections that intermediate credibility arises.

Knowledge is merely consciousness of appearances; the flip-side, as it were, of the event of appearance. Viewed in this perspective, without making claims to anything but the phenomenal, knowledge is always a faithful rendering of the way things appear. We may speak of knowledge itself as being realistic or as unrealistic or as hypothetical, only insofar as we understand that this refers to *the kind of* appearance it reflects.

These characterizations refer primarily, not to knowledge, but to its objects.

The difference between knowledge (in its narrower sense of, knowledge of reality) and opinion (in the sense of, the practically known), is thus merely one of degree of credibility *manifested by their objects* (at that time); we cannot point to any essential, structural difference between them. However, this distinction is still significant: it matters a lot that the objects carry different weights of conviction.

Changes or differences in appearances and opinion are to some extent *explained* by reference to variations in our perspective, and breadth and depth of consciousness. But this explanation does not annul the primacy of phenomena, in all their aspects.

In practice, median credibility is often not patiently accepted, but we use our ‘wisdom’ to lean one way or the other a bit, according to which idea seems to ‘hang together’ the best. But a contrary function of wisdom is the ability to see alternatives, or the remote possibility of suggested alternatives, and thus keep an open mind. The intelligent man is able to take positions where others dither, and also to see problems where others see certainties.

3. Logical Modality

Drawn from Future Logic (1990), Chapter 21.

1. The Singular Modalities

The concepts of 'logical modality' enable us to predict systematically all the ways credibility may arise in knowledge over the long-term. Credibility itself is not a type of modality, but the ground and outcome of logical modality. We shall immediately define the primary categories of logical modality, and thereafter discuss their development, their significance, and their justification:

Truth is the character of a proposition which seems more convincing than its negation, in a given context of knowledge. In the case of any proposition implied by its own negation, its credibility is extreme.

Falsehood is the character of a proposition which seems less convincing than its negation, in a given context of knowledge. In the case of any proposition implying its own negation, its incredibility is extreme.

A proposition is ***'problematic'***, with regard to its truth or falsehood, if it seems to carry neither more nor less conviction than its negation, in the given context of knowledge. This is indicated by such expressions as 'might or not be' or 'perhaps is and perhaps is not'.

In practical terms, the ***degree of credibility***, whether high, low, or median, of a proposition is a measure of the amount of evidence or counterevidence put forward on its behalf or against it. This refers to the weighting of information by confirmation or undermining, which topic will be dealt with more fully under the heading of adduction.

By (logical) ***context*** is meant, the accumulated experiences and conceptual insights of the knower (a person or society) at the time concerned.

The context-specific concepts of logical modality are built on the awareness that: at every stage of knowledge, some things

somehow seem 'true', other things somehow seem 'false', yet others seem 'problematic'; and that these attributes often vary with the growth of experience and reasoning.

These observations suggest that, although every appearance is accompanied by some such characterization, the characterization is not in all cases firmly attached to the object, but is often a function of the experience and reasoning which have preceded them.

The concepts are thus formed, to begin with, only in recognition that such events occur, and that they are distinguishable by our consciousness, and that they each display such and such properties. Then we say: 'Let us call this truth or falsehood or problemacy, as the case may be….'

It must be stressed that underlying the foregoing definitions of truth, falsehood, and problemacy, is the assumption that a sincere effort of awareness took place. It is difficult to insert such technical specifications in our definitions explicitly, without engaging in circularity, but there is no doubt that the definitions would lose all their value and significance without this tacit understanding.

A true or false proposition is called *'assertoric'*, because it makes a definite claim. A problematic proposition is not assertoric: it presents an appearance with equal tendency in both directions, and therefore devoid of tendency; it calls upon us to consider a hypothesis.

Problemacy signifies a suspension of judgment. It does not signify the existence of 'real' indeterminacy, but only recognizes the appearance of indeterminacy in contexts less than complete. In reality, we believe, every issue is settled, once the event takes place; in omniscience, there would accordingly be no problemacy — it only arises in more limited viewpoints.

Problemacy has no equivalent outside logical modality; being freely open to change as knowledge evolves, there is no error in saying that any proposition we choose to formulate is at first encounter problematic.

Note that meaningful, precise, and clear, propositions may be true, false or problematic. Meaningless propositions are

classified as false. Vague or obscure propositions, as at best problematic, if not false.

Factual assertorics of less than extreme credibility and problematics, give a semblance of co-presence or co-absence of opposites. The laws of contradiction and of the excluded middle are our reminders that that impression is transient; ultimately, everything is either totally credible or completely incredible. In other words, so long as we make no attempt to at once apply both truth and falsehood, or both untruth and unfalsehood, no law is broken; but as soon as we lay claim to more than the propositions suggest, we err.

For this reason, we can effectively discard nonextreme assertions and problems, and say of any proposition: it cannot be both true and false, and cannot be neither true nor false. There is ultimately no mixing or in-between of these attributes; our goal is to arrive to the extremes, not to linger on intermediate stages. There would be no point in constructing a logical system with reference to the finer gradations of credibility: it would be immobile.

2. The Plural Modalities.

Truth and falsehood are the categories of logical modality *with a single, given context* as their frame of reference.

Truth is a category of logical modality lying between logical necessity and possibility. Falsehood is the exact contradictory of truth, lying between logical impossibility and unnecessity. Truth is fact and falsehood is fiction, ideally. So, we may call them the *'factual'* level of logical modality; in analogy to the actual level of natural or temporal modality, or the singular level of extensional modality; but this is only an analogy, not an equation.

The categories of logical modality referring to *a plurality of unspecified contexts*:

Logical ***necessity*** characterizes a proposition which is true in every context, and in that sense is true irrespective of any given context.

Logical ***impossibility*** characterizes a proposition which is false in every context, and in that sense is false irrespective of any given context.

Logical ***contingency*** characterizes a proposition which has neither the attribute of necessity nor that of impossibility, as they are above defined, so that it is true in some contexts and false in others.

Logical ***incontingency*** is the negation of contingency, the common attribute of necessary and impossible propositions. Logical *possibility* is the negation of impossibility, the common attribute of necessary and contingent propositions: truth in some contexts. Logical *unnecessity* is the negation of necessity, the common attribute of impossible and contingent propositions: falsehood in some contexts.

With regard to corresponding concepts of logical ***probability*** or ***improbability***.

We can say that, in this system, truth or falsehood correspond to mere incidence or non-incidence; necessity or impossibility signify the extremes (100%) of probability or improbability, and contingency concerns intermediate degrees (less than 100%) of these. Thus, to be consistent, we must define the logically probable as what would be true in most contexts (or false in a minority of contexts), and the logically improbable as what would be true in few contexts (or false in a majority of contexts).

These concepts would then enable us to specify our breadth of vision — effectively, how many eventual changes of context we have taken into consideration in making a prediction. The practical feasibility of this, with some precision, and the relation of logical probability and credibility, will be explored when we deal with adduction.

Thus, in summary, ***logical modality*** may be defined as a qualification of propositions as such, informing us as to whether each is true or false, in this (i.e. a given) context, only some (unspecified) contexts, or all contexts, or somewhere in between these main categories.

Here again, it must be emphasized that ‘is true’ (meaning, seems more convincing than not) and ‘is false’ (seems less convincing than its contradictory), depend for their plausibility on our

having sought out and scrutinized the available information with integrity. This issue is discussed in more detail in the next chapter.

I want to emphasize here that the concepts of logical modality, as here defined, are prior to concepts of logical relation, like implication, which (as we shall see) they are used to define.

The former are built on the vague, notion of a proposition being variously credible *'in'* some context(s). Although this 'in' suggests that a kind of causality is taking place, it is not yet at the stage where specific relations like implication may be discussed. There is only a mental image of items 'pushing' others into existence; a very sensory notion.

Likewise, our first encounter with 'credibility' is very intuitive, something intrinsic to our every consciousness. The later systematic understanding of credibility, with reference to adduction, is merely a report on when it occurs, not a substitute for that primitive, inner notion.[2]

3. Analogies and Contrasts

Various analogies and contrasts between the singular and plural modalities are worthy of note. The former measure credibilities in any one context. The latter take a broader perspective, and compare credibilities in a variety of contexts. Thus, true, false, and problematic are comparable to necessary, impossible, and contingent — but they are not identical.

Contingent truth and falsehood are contextual, whereas necessity and impossibility (incontingent truth and falsehood)

2 It is interesting that, in Hebrew, the word for 'with' is *'im'* (spelt ayin-mem), and that for 'if' is *'im'* (spelt aleph-mem). In that language, if I am not mistaken, when verbal roots are that close, it signifies that the thoughts underlying them are also close. I wonder if the English words 'in' and 'if' have similar origins, rather than those most philologists assume.
Incidentally, also similar in Hebrew, are the words *'az'* (spelt alef-zayin), meaning 'then' in time or logic, and *'oz'* (spelt ayin-zayin), meaning 'strength'. This confirms what I said above, that the notion of logical causality is rooted in an intuitive analogy to physical force.

effectively transcend context. What holds in every context, holds no matter what the context, whereas the contextual is tied to context and in principle liable to revision (though that may never happen).

Note that it is the *realization* of contingency as truth or falsehood, which is relative to context, but the contingency in itself is no less absolute (with respect to context) than necessity or impossibility.

A careful distinction must be made between the truth, falsehood, or problemacy, of a proposition whose logical necessity, contingency, or impossibility is unspecified — and the truth, falsehood, or problemacy, of any proposed modal specification for that proposition. Failure to distinguish between these perspectives can be very confusing.

A proposition may be problematic to the extent that, not only do we not know whether it is true or false, but we do not even know whether it is logically necessary, contingent, or impossible.

Less extremely, we may know the proposition to be true or false (and thus, possible or unnecessary), yet not know whether it is logically necessary, contingent (possible *and* unnecessary), or impossible. In such case, the singular modality (the proposition per se) is assertoric, but the plural modality is still to some extent problematic.

If a proposition is known to be logically necessary or impossible, then it is assertoric with regard to both its plural modality (the incontingency) and to its singular modality (accordingly, true or false).

If a proposition is known to be logically contingent, it is assertoric with respect to its plural modality (the contingency). We may additionally know that the proposition per se is true or false, in which case it is also assertoric with respect to its singular modality. Or we may still be at a loss as to whether it is true or false, so that it is problematic with respect to its singular modality.

In any case, here again, problemacy does not signify real indeterminacy, but merely absence of sufficient knowledge, remember.

Our definitions make clear that problemacy should not be confused with logical contingency. A proposition may be definitely true or false, and so unproblematic, and still contingent; and a problematic proposition may after serious consideration be found to be necessary or impossible, whereas a properly contingent proposition should not thus change status.

Yet problemacy and contingency have marked technical analogies, which allow us to treat any problematic proposition (and therefore any proposition whatever, at first encounter) as *effectively* contingent in logical properties. Logic repeatedly makes use of this valuable principle. As will be seen, if the proposition is not indeed contingent, it will be automatically revealed so eventually through dilemmatic argument, so that no permanent damage ensues from our assumption.

Note that the definitions of the logical modalities are very similar to those of extensional, natural and temporal modalities. There is a marked quantitative analogy (this, some, all), so that we can refer to them as 'categories of modality'; and there is a broad qualitative analogy (inclusion or exclusion in a wider perspective), yet with enough difference that we can refer to them as distinct 'types of modality'.

Logical modality puts more emphasis on epistemology than ontology, in comparison to the other types. It primarily qualifies knowledge, rather than the objects of knowledge. Whereas natural modality refers to the objective circumstantial environment of events, temporal modality to surrounding times, and extensional modality to cognate instances — logical modality looks at the informational setting.

With regard to technical properties, logical modality is often similar to the other types, but some notable differences also occur, as we shall see as we go along.

4. Apodictic Knowledge

The many-contexts concepts of logical modality are formed by reference to the awareness that there are items of knowledge which somehow would seem to be true or false no matter what developments in knowledge may conceivably take shape, while

others seem somehow more dependent on empirical evidence for their acceptance or rejection. The former are often called 'a priori' or *'apodictic'*, and the latter 'a posteriori'.

At first sight, apodictic statements present a difficulty. They seem inaccessible to anyone with less than total knowledge. Only the fully omniscient could know what is necessary or impossible in the widest context. A normally limited mind like ours cannot have foreknowledge of any final verities. Indeed, even if we ever reached omniscience, how could we be sure we have reached it?

However, these skeptical arguments can be rebutted on several grounds. To begin with, they are self-defeating in that they themselves claim knowledge about the capabilities of omniscience, and they do so in no uncertain terms: therefore, they are intrinsically conceptually flawed. Logically, then, it is conceivable for a limited mind to acquire apodictic knowledge, somehow.

Secondly, it is noteworthy that our minds, though admittedly less than omniscient, are not rigidly limited in their powers of imagination. We are able to construct innumerable hypotheses even with a limited amount of factual data to play with. Thus, we are never limited to one context, the present one, but can manipulate ideas which go beyond it. Of course, this does not mean that our imagination is able to foresee all contexts. The more factual data we have to feed on, the more our imagination can stretch out — but we never have all the seeds.

Thirdly, the skeptical arguments misconstrue the issues. We defined the necessary as true, and the impossible as false — 'in every context'. We did not say, the necessary is what is true, and the impossible is what is false — 'to the omniscient'. Our definition does not exclude that the quality of necessity or impossibility be *given as such within any single context*, as an inherent component of the appearance. It does not logically mean that we have to foretell what goes on in other contexts besides our own.

And indeed, we find within common knowledge many instances of manifest necessity or impossibility, without need of further

investigations. Such events constitute the experiential basis for these concepts.

The primary examples of this are Aristotle's laws of thought. They strike us as intrinsically overwhelming, as in themselves capable of overriding any other consideration of knowledge. We can only ever deny them reflectively, by obscuring their impact; but the moment we encounter them plainly, their practical force is felt. When we are face to face with a specific contradiction, we see that it is nonsense and that something, somewhere must be amiss. That is why the laws of identity, of contradiction, and the excluded middle are naturally adopted as the axioms of logical science.

But other examples abound. More generally, as we shall see, a proposition is self-evident, if it is implied by its own negation, or implied by any contradictories; and a proposition is self-contradictory, if its affirmation implies its own negation, or implies any contradictories. It will be shown that a self-evident proposition displays the consequent property of being implied by any conceivable proposition, and a self-contradictory proposition that of implying any conceivable proposition. 'Any' here means 'every' — so that these are cases of logical necessity or impossibility.

This may occur *formally*, for all propositions of a certain kind whatever values be assigned to their variables. Indeed, the science of logic itself may be viewed as a record of all such occurrences. Or it may occur *contentually* (or 'materially'), in the sense: not for all propositions of a certain kind, but only with certain specific contents. Note that this distinction is somewhat relative, depending on what we hold fixed and what we allow to vary.

Another way apodictic knowledge (or, for that matter, any knowledge) might conceivably be made available to a limited mind is through *revelation*, a communication from an omniscient mind. This is the logical premise of religion. *Faith* might be defined as the conviction that the information does indeed come from an infallible source, G-d. This topic is too vast to be discussed in this treatise, but I merely wanted to indicate the entry point.

Now, if logical necessity or impossibility are somehow given as components of the appearance of things in any context of knowledge, what is their difference from (contingent) truth or falsehood, which are also given?

Theoretically, once a proposition has been seriously scrutinized and found not to be necessary or impossible, it henceforth remains permanently contingent — just as once a proposition is seen to be necessary or impossible, its status is thenceforth established. In practice a mistake might conceivably be made, but this does not affect the principle.

The essence of necessity or impossibility is their property of self-evidence or self-contradiction; it is not their permanence, which is only incidental. Contingent truths or falsehoods may also be permanent; a proposition may happen to remain true or false without change as knowledge evolves, and yet never lose its contingent status. That some contingent truths or falsehoods do change over time, is irrelevant. Even in a total knowledge context, truths or falsehoods may be characterized as contingent.

Thus, we do not regard an obvious empirical truth like ‘it is now raining’, or a well-established law of nature like ‘the amount of matter and energy in the universe are constant’, as logically necessary, even though we believe them to happen to be fixed truths (each in its own way), because they do not seem self-evident; they are both therefore intrinsically logically contingent. The raw, factual finality of the former or the natural necessity of the latter do not affect their common logical status.

On this basis, we can also say that logical contingency is conceptually distinct from problemacy. In omniscience, problemacy disappears, but not logical contingency. The latter remains as a further qualification of certain truths and falsehoods, distinguishing them from logical necessities and impossibilities, respectively. It follows that contingency as such is not a lower status than necessity or impossibility.

Lastly, note, a necessity or impossibility may be immediately apparent to anyone, or we may need to go through a long or complicated reasoning process to make it apparent. But in either case, the sense of obviousness is given within the appearance

itself, so that the ease or difficulty with which we were brought to the insight are irrelevant to its finality.

It is hard to distinguish a priori and a posteriori knowledge by reference to the concepts of reason and experience. The former is indeed more purely analytical, but it cannot occur without the minimum of experience on the basis of which the concepts involved are meaningful and clear. Likewise, the latter is indeed more likely to be affected by changes in experience, but its conceptualization and logical evaluation involve a great deal of rational activity.

4. CONTEXTUALITY

Drawn from Future Logic (1990), Chapter 22.

1. Statics

We defined logical modalities with reference to the relative credibilities of appearances 'within contexts'. We will here try to clarify what constitutes a context, and its role.

In a very narrow, 'logical' sense, one might refer to the context of a proposition as any arbitrary set of propositions. In this sense, a proposition could be taken in isolation and constitute its own context. It might still appear to us as true (if in itself reasonable looking) or false (if obviously internally inconsistent) or even problematic (if of uncertain meaning). Likewise, for any larger set of propositions we choose to focus on exclusively. But this leads to a very restricted sense of truth or falsehood.

In practice, there is no such animal. A more 'epistemological' understanding of context is called for. The effective context of any proposition is not arbitrarily delimitable, but is a very wide body of information, which, whether we are conscious of it or not, impinges on our judgement concerning the proposition. It is the 'status quo' of knowledge at a given time, for a given individual or group.

A proposition is not just a string of words or symbols written on a piece of paper; it has to mean something to become an object of logical discussion. We cannot consider it in isolation, because our consciousness is, like it or not, always determined by a mass of present or remembered perceptual and conceptual data. This periphery is bound to affect our reaction to the proposition at hand.

It is in acknowledgement of this dependency that our definitions of logical modality must be constructed. The context of a proposition is thus all the things we are experiencing or thinking, or remember or forgot having experienced and thought — which

happen to color the proposition at hand as credible or not, to whatever degree.

This is not intended as a psychological observation, suggesting that our judgment is being warped by structural or emotional factors; in some cases it indeed is, in others not. Nor is the issue what we consciously take into consideration; that may have no effect, and there may be unconscious influences anyway.

It is merely a recognition that the appearance of realism or unrealism of any proposition is always a function of a great amount of data, besides it and any artificially selected framework. The contextual data generating such a result include: perceptions, direct conceptual insights, and indirect inductions and deductions. Hence the concept of a context, as here used. It refers to the actual surrounding conditions of our knowledge.

It is hard to pinpoint precisely and with unfailing accuracy just which of the peripheral information impinges on a given proposition's evaluation. Innumerable wordless sensations, mental images, and intuitions, are involved, and merely having had logically relevant experiences or thoughts, does not entail that they played any effective role in the present result. All we can say with certitude is that a lot of data is involved in the final display of some quality of credibility by a proposition.

The whole of logical science may be viewed as an ongoing attempt to investigate this aetiology. Its job is to find just what causes propositions to carry conviction or fail to do so, and how the totality of knowledge can be gradually perfected. We have seen its work in the domain of deduction with certain categorical propositions; now other forms are about to be analyzed. The solution to the problem of knowledge is not found in simplistic and vague pontifications, nor in a step-by-step linear guidebook, but in a vast tapestry of interlocking considerations.

2. Dynamics

The concepts of truth, falsehood, and problemacy, refer to the deployments of credibility in a static context, the 'state of affairs' in knowledge at a given stage. The concepts of necessity,

impossibility, and contingency, refer to the changes of credibility: they consider knowledge more dynamically.

Knowledge is an evolving thing. We, human beings, are none of us ever omniscient or infallible. If our consciousness was unlimited by space, time, and structural resources, like God's, there would be no problematic knowledge: every proposition would be true or false with finality. Just as reality is one, knowledge would be one and complete.

But reality is opened to our consciousness piecemeal, over time. We are obliged to repeatedly adapt to new factual input. Indeed, we have to actively dig into reality, if we want to approach that ultimate goal of total consciousness of everything.

We know we cannot reach that goal, since we have already missed out on enormous tracts of reality in the distant past, and the whole future is ahead of us, unexplored. We know that innumerable phenomena are happening all around us and within us, all the time, at every level (from the sub-atomic to the astronomical, from the material and physiological to the mental and spiritual); and we cannot keep track of all that. Thus, the data available to us is inevitably restricted.

Furthermore, our faculties of knowledge can play tricks on us, and draw us away from the goal. Our eyes may be myopic, our memory may fail, our reasoning may be muddled, we may be too imaginative, our mind may be moved by very subjective, emotional, considerations. We have to somehow make-do, in spite of all such imperfections in our make-up.

Our response to these limitations, if we are intent on knowing reality, is staying aware of our mental processes, and unflagging re-evaluation of what and how much we know or ignore. This is where logical modality comes into play. It provides us with labels we can attach to each and every proposition, which assign it a rank, as we proceed.

Theoretically, we take the full body of everything we have experienced or thought thus far, and order the present information in a hierarchy. Tools may be invented to increase our certainties: eyeglasses, the written word, a science of logic. The sources of information are considered: we distinguish between the fictions of our imagination and the facts of sense

data, between vague and clear concepts, between fallacious and rigorous argumentation.

In practice, things are more dynamic than that. We may take some part of our data base, and hold it still long enough to evaluate it with the proper amount of reflection. But, on the whole, the process is on-going, an ad hoc response to the flux of information. Logical modalities allow us to register our value-judgments of this kind as we proceed, like a running commentary.

3. Time-Frames

Now, there are three ways for knowledge to evolve, and credibility to change. We may associate the word 'context' to the sum total of knowledge, the whole environment — or, more restrictively, to a given body of fundamental axioms and raw data, a *framework*. Here, let us use it in the latter sense.

We may not have drawn all the possible lessons from these primary givens; the process is not automatic, but has a time dimension. A proposition may be logically implicit in knowledge I already have, but it may take me time and effort to discover it.

There is always a great deal of undigested, unexploited information in our memory banks, and accessing it and assessing it demand time and skill. I mean, Philosophy, for example, requires relatively little raw data to develop considerably, because it pursues facts implicit in every existent. This is internal development, or context *intensifying*.

Or we may receive new input of rational axioms and empirical data to consider. Here, two alternatives exist: either the new facts already existed out there, but unbeknown to us; or some change occurred in these external objects themselves, which we accordingly now absorb as new existents. These are developments fed from the outside, or context *extending*.

Thus, we may distinguish between three time-frames for modality change: the external time in which objects change into new objects; the interfacial time of turning our attention and sensors towards pre-existing objects — to extend context; and

the internal time of mental assimilation of memory (analyzing, comparing, checking consistency) — the work of intensifying context.

The first of these essentially pertains to natural and temporal modality; the second, extensional modality; the third, is the time-frame of logical modality. But all of them, if only incidentally, concern logical modality.

4. Context Comparisons

That our definitions of truth and falsehood do not specify the context taken as being final and ideal, is not a relativistic position. It is merely intended as a statement that every proposition's credibility is conditioned by a totality.

The given context is pragmatically accepted as a starting point for further inquiry, without thereby being regarded as 'the best of all possible contexts'. It is subject to change, to improvement. Some contexts are to be favored over others — the exact grounds just need to be elucidated.

We might refer to the overall credibility of a context. We could perhaps consider any given context as a whole, and (of course, very roughly) sum-up and average the credibilities of its constituents, and thus get an estimate of its finality or staying-power. But, quite apart from the issue of practical feasibility, I do not think this would be of any use. The relative credibilities given within each context pertain to that context alone, and have no bearing on the relative credibilities in other contexts.

The general principle for comparing contexts seems obvious enough. Contexts are of varying scope and intensity, and it is clear that *the deeper and wider the context, the closer to final* will the impressions of truth or falsehood concerning any proposition in it be; and the less numerous will doubtful cases be. Thus, the bigger and more cohesive the context, the better.

The ideal context of omniscience is beyond man's power, we can only gradually approach it. But we can say that in that ultimate, limiting case, the impressions of truth or falsehood would be final, subject to no further change or appeal; and furthermore, there would be no in-between impressions of a

doubtful kind, since reality once established is determinate. Here, knowledge and reality would correspond entirely.

When we apply the above principle to one person over time, it is relatively easy to say which context is to be preferred. The more information at his or her disposal, the more this information has been carefully sifted for hidden messages, the more certain may that person be. For the individual, improvement is almost inevitable over time, because his or her context is a widening circle.

We always refer to appearance, though we can distinguish between prima-facie impressions and well-tested impressions. The two kinds of impression are essentially the same in nature, but they have different positions in a continuum stretching from subjectivity and mere belief (which still however contain seeds of objectivity and knowledge) to ultimate realism and certainty.

When, however, we compare the contexts of two (or more) people, it is not so easy to say which is better or worse. Each may have data the other lacks, and each may have thought about any item of data they have in common more thoroughly than the other. Thus, they may disagree in their conclusions, and yet both be 'right' for their respective contexts. And since their contexts overlap in only some respects, so that neither embraces the other as a whole, the contexts cannot be rated better or worse.

All we can do is focus on specific areas of knowledge, and consider the relative expertise of each individual in that area. If someone is a specialist in some field, we may well assign greater credibility to his or her pronouncements on the subject. On this basis, we may even trust a person we know to be generally very wise, without committing the fallacy of 'ad hominem'.

5. Personal and Social

We must distinguish, here, between personal and social knowledge.

At the lowest level, is 'personal knowledge'. Some people are better at knowing than others, because of their healthier faculties, or because they are endowed with more intelligence and insight, or because they are more interested, more careful,

and make more of an effort, in this domain. Also, individuals inevitably have different quantities of information at their disposal, both inner and outer.

'Social knowledge' is an ideal. We collectively, across cultural boundaries and the generations, gradually compile a record of common knowledge, agreed upon methods, information and conclusions. It is the human heritage, our shared data bank.

An individual may admittedly have more knowledge of some field than everyone else at a given time; he may get to share it, or it may disappear with him. There may be specific disagreements at any time between groups of individuals. It may even happen that the majority of the peer group wrongly rejects an individual's valuable contribution.

Yet, over time, the collective enterprise we call Science develops, a pool of knowledge greater and truer than any which individuals can fully match, based on a methodological consensus.

Since credibilities depend on context, individuals may assign different credibilities to the same proposition. To that extent, truth and falsehood are often 'subjective', since they reflect the mental abilities and dispositions of people.

Still, I may take all the premises of another person and demonstrate that his evaluations are logically incorrect even for his context. In a sense, I start off with the same context as him, and end up with a slightly different version; but in another sense, I have merely clarified the given context, brought out its full potential, without significantly altering it. If he is intelligent and honest enough, he normally bows to the evidence.

Thus, the contextuality of credibility need not imply its utter subjectivity. The evaluation can only ultimately be viewed as subjective in the pejorative sense, if it is contextually wrong.

And even then, such accusation can only be leveled fairly if the individual allowed psychological forces to sway his judgment. He may be intellectually negligent through laziness, or dishonestly evade unpleasant or frightening data or thoughts, or insincerely report his conclusions. If the error was honest, merely due to a failure to notice a connection, we can hardly criticize him, only correct him.

We get around these problems of personal weakness through the institution of social knowledge, science. This allows us to collectively ‘average-out’ the subjective vector. We mutually scrutinize and criticize each other’s contributions, until we are of one mind. There may still be collective delusion, but that at least eliminates personal deviations from logical norms.

We presume that the influence of our collective mind-sets will gradually wither away as knowledge develops further. This assumption is justified by previous developments: we have seen historical examples of liberation from ideas which seemed immovable. The notion that science is inevitably subjective, is derived from such liberations, and cannot be used to denigrate them.

5. ADDUCTION

Drawn from Future Logic (1990), Chapter 46.

1. Logical Probability

Induction, in the widest sense, is concerned with finding the probable implications of theses. Deduction may then be viewed as the ideal or limiting case of induction, when the probability is maximal or 100%, so that the conclusion is necessary. In a narrower sense, induction concerns all probabilities below necessity, when a deductive inference is not feasible.

a. All this refers to logical probability. A thesis is logically possible if there is some chance, any chance, of it being found true, rather than false. 'Probability' signifies more defined possibility, to degrees of possibility, as it were.

Thus, we understand that low probability means fewer chances of truth as against falsehood; high probability signifies greater chances of such outcome; even probability implies that the chances are equal. High and low probability are also called probability (in a narrower sense) and improbability (with the im-prefix suggesting 'not very'), respectively. Necessity and impossibility are then the utter extremes of probability and improbability, respectively.

There are levels of possibility, delimited by the context, the logical environment. This can be said even with regard even to formal propositions. Taken by itself, any proposition of (say) the form 'S is P', is possible. But, for instance, in the given context 'S is M and M is P', that proposition becomes (relatively) necessary: its level of possibility has been formally raised. Alternatively, in the given context 'S is M and M is not P', that proposition becomes (relatively) impossible: its level of possibility has been formally lowered.

The same applies with specific contents. At first sight, every statement about anything seems logically 'possible'. This just

means that the form is acceptable, there exist other contents for it of known value — a well-guarded stamp of approval.

As we analyze it further, however, we find the statement tending either toward truth or toward falsehood. We express this judgement by introducing a modality of probability into the statement. We place the statement in a logical continuum from nil to total credibility.

In any case, we know from experience that such probabilities are rarely permanent. They may increase or decrease; they may first rise, then decline, then rise again. They vary with context changes. Keeping track of these probabilities is the function of induction. For example, when a contradiction arises between two or more propositions, they are all put in doubt somewhat, and their negations are all raised in our esteem to some extent, until we can pinpoint the fault more precisely.

b. In the chapter on credibility, we described degrees of credibility as impressions seemingly immediately apparent in any phenomenon. Thus, credibility is a point-blank, intuitive notion. In the chapter on logical modality, on the other hand, we showed that the definitions of unspecific plural modalities coerced us into the definition of logical probabilities with reference to a majority or minority of contexts. Thus, knowledge of logical probability presupposes a certain effort and sophistication of thought, a greater awareness of context.

Here, we must inquire into the relation between credibility and logical probability.

Every proposition has, *ab-initio*, *some* credibility, if only by virtue of our being able to formulate it with any meaning. This intuitive credibility is undifferentiated, in the sense that, so long as it is unchallenged, it is virtually, effectively, total. But at the same time, this credibility is not very informative or decisive, because the opposite thesis may have been ignored or may be found to have equal credibility.

As we begin to consider the proposition in its immediate context, and we find contradictions (or even sense some unspecified cause for doubt), the credibility becomes more comparative, and it is certified or annulled, or seen as more or less than extreme one way or the other, or as problematic (equally balanced).

As our perspective is broadened, and we project changes in context, the problematic credibilities become more qualified — that is, they are quantified by some specific logical probability, so that they shift more decidedly in either direction. Thus, problemacy (median credibility) may be viewed as the very minimum, the beginning, of probability.

In this way, all the plural logical modalities may be viewed as 'filtering down' to the single-context level of truth or falsehood. This transmission of modality, from the high level of many-contexts to the low level of the present context, may be immediately apparent (as in the case of necessities and impossibilities), or may gradually develop over time (as with all contingent probabilities).

As probabilities vary, through new inputs of raw data into the actual context, so that more alternative contexts are imaginable, and through closer scrutiny of available data — the credibilities under their influence also and proportionally change.

Logical probability, as formally defined, is impossible to know with finality. The exception is in the extreme cases of logical necessity or impossibility, which can be known even without access to all conceivable contexts, through the one-time discovery of self-evidence or self-contradiction (in paradoxical propositions); these modalities are permanent.

But in all cases of logical probability based on contingency, there is no way to make a sure statement of the form 'In most contexts,…'. All we can refer to are: most of the contexts *considered so far*; these may in reality be a minority of all possible contexts, for all we know. Such modal statements are therefore not static, never entirely final.

We have shifted the concept of logical probability from its rigid formal definition as 'true in most contexts', to a more practical version: 'true in most *known* contexts'. It thus is no longer implied to be static; but it is now flexible, and suggests comparison of credibilities with a reasonable degree of purpose.

Thus, the concepts of (comparative) credibility and logical probability ultimately blur, and can to some extent be used interchangeably. However, if we understand logical probability in its strictest sense, as *based on and implying* logical possibility,

then it should not be confused with credibility, which is even applicable to logically impossible propositions (until their self-contradiction is discovered). Here, I use ‘probability’ in an indeterminate sense, so as to avoid the issue.

The main purpose of induction is to lead us to facts, to hopefully true specific contents. How we know their logical probabilities is not a separate or additional goal for inductive research; it is one and the same issue with that of knowing their truths. In the process of pursuit of facts, by evaluating our current distance from the establishment of truth, *we are incidentally also finding their logical probabilities*.

Ultimately, we would like to construct a clear, step-by-step, *model* of human knowledge, showing precisely how each proposition in it is arrived at; but in the meantime, the processes involved can be broadly defined. How exactly do we get to know these logical gradations? They are not arbitrary, not expressions of subjective preference, not intuitive guesses; there is a system to such evaluations.

2. Providing Evidence

The investigation of this problem in general terms, that is, without reference to specific forms, may be called *‘adduction’*. Adduction provides us with the rules of evidence and counterevidence, which allow us to weight the varying probabilities of theses.

The more evidence we adduce for our proposed thesis, the more it is *confirmed* (strengthened); the more evidence we adduce to a contrary thesis, the more is ours *undermined* (weakened). These valuations should not be confused with proof and refutation, which refer to the ideal, extreme powers of evidence.

Adduction is performed by means of the logical relations described by hypothetical and disjunctive propositions. These, we saw, are normally based on the separate logical possibility of two theses, and inform us about the logical modalities of their conjunctions, together or with each other’s antitheses. They establish connections of varying degree, direction, and polarity.

Now, ‘If P, then Q’ represents necessary connection, the highest level; it could be stated as ‘if P, necessarily Q’. Accordingly, ‘if P, then nonQ’, incompatibility, could be stated ‘if P, impossibly Q’. The contradictories of these would be ‘if P, possibly Q’ (= ‘if P, not-then nonQ’) and ‘if P, possibly not Q’ (= ‘if P, not-then Q’). We can, following this pattern, think in terms of probabilities of connection.

a. Adductive argument evolves out of apodosis. It most typically takes the forms:

If P, then Q	If P, then Q
and Q	but not P
hence, probably P.	hence, probably not Q.

These conclusions, so far, do not express the precise degree of probability; they do indicate that the possible result has *increased in probability*. The possibility of the result is already implicit in the major premise to some extent. A deductive, necessary, conclusion would not be justified. But we are one step ahead, in that it is conceivable that the minor premise is true *because* the proposed conclusion was true.

We argue backwards, from the consequent to the antecedent, or from the denial of the antecedent to the denial of the consequent. As apodosis, this is of course invalid; but here we view the minor premise as an *index to*, rather than proof of, the conclusion.

The more hypotheses suggest a conclusion, the more probably will it turn out to be true. The less hypotheses suggest a conclusion, the more probably will it turn out to be false. Thus, ***‘evidence’*** may be defined as whatever increases the logical probability of a thesis by any amount, and ***‘counterevidence’*** refers to sources of decrease.

Through adduction, we mentally shift from incipient credibility and problemacy, to a more pondered logical probability.

Note that the first mood, the affirmative one, is strictly more correct than the second, negative, mood. For, in the negative case, we presuppose the major premise not to be complemented by ‘if nonP, then Q’, even though the latter is a formally

conceivable adjunct. That is, we are presuming that ‘nonQ’ is logically possible, without prior justification, since this is not always part of the basis of the major premise. Whereas, in the positive case, if ‘if nonP, then Q’ were also given, the additional conclusion ‘probably not P’ would balance but not strictly contradict ‘probably P’, and also allow Q to be logically necessary.

It follows that the conclusion of the negative mood is more precisely, ‘if nonQ is at all possible, then it is now more probable’. But since, as earlier pointed out, every proposition is at first encounter logically possible, this is not a very significant distinction. The issue of basis is more serious for natural, temporal or extensional conditionals than for logical conditionals.

We can simply say that if ‘nonQ’ turns out to be logically impossible for other reasons, then of course the initial possibility is thenceforth annulled. Such an eventuality is not excluded by the negative adductive argument, just as the positive version allows for the eventual denial of P, anyway.

Note then that the loose sense of logical probability here intended does not imply that ‘P is logically possible’ (in the first mood) or that ‘nonQ is logically possible’ (in the second mood), unless these possibilities were part of the tacit basis of the major premise. Logical possibility must still be strictly understood as signifying an established necessity or contingency.

b. Other moods of adduction follow by changing the polarities of theses. These represent other valuable approaches to provision of evidence or counterevidence, confirmation or undermining.

If P, then nonQ	If P, then nonQ
and not Q	but not P
hence, probably P.	hence, probably Q.

If nonP, then Q	If nonP, then Q
and Q	but P

hence, probably not P.	hence, probably not Q.

If nonP, then nonQ	If nonP, then nonQ
and not Q	but P
hence, probably not P.	hence, probably Q.

Note that if the major premise is contraposed, the conclusion remains the same. This shows that the listed moods constitute a consistent system.

We can also form disjunctive adductive arguments, like the following, with any number of theses:

P or else Q	P and/or Q
but not P	but P
hence, probably Q	hence, probably not Q

c. It is clear that if the major and/or minor premise in all these arguments were probabilistic, instead of fully necessary or factual, some probability would still be transmitted down to the conclusion, albeit a proportionately more tenuous one.

This principle of 'transmissibility' of credibility, let us call it, is very important to logic, because it means that, although deductive logic was designed with absolutely true premises in mind, its results are still applicable to premises of only relative truth. Thus, deductive processes also have some inductive utility.

We previously made a clear distinction between the 'uppercase' forms of hypothetical, like 'if P, then nonQ', which involve a logically necessary connection, with the lowercase forms, like 'if P, not-then Q', which merely establish a compatibility. This distinction is especially important in deductive argument, such as apodosis.

We can conceive of less than necessary major premises, having forms like 'if P, possibly or probably Q'. Some probability is still transmitted down to the conclusion, though of course again much more tentatively and insignificantly. We can regard thus

arguments like the following as also adductive; in fact, they are the most comprehensive formats of adductive argument.

If P, probably Q, and probably P, hence, probably Q.	If P, probably Q, and probably Q, hence, probably P.
If P, probably Q, and probably not P, hence, probably not Q.	If P, probably Q, and probably not Q, hence, probably not P.

In such argument, the probabilities involved may have any degree. Also, the premises may have very different probabilities; and the probability of the conclusion depends on the overlap, if any, of the conditions for realization of the premises, so that it is generally far inferior. It is normally very difficult to quantify such probabilities precisely; but, when we can estimate the degrees of the premises, we can accordingly calculate the degree of the conclusion (which may be zero, if there is no overlap).

We could thus expand our definitions of apodosis and adduction, so that they are equivocal. In that case apodosis and adduction (in the narrow senses we adopted) would respectively be: forward and backward apodosis (in the larger sense), or necessary/deductive and merely-probable/inductive adduction (in the larger sense). This is mentioned only to show the continuity of the two processes.

Note that when we formulate hypothetical propositions, we often order the theses according to their probabilities. 'If P, then Q' may intend to implicitly suggest, that P is so far more probable than Q, and may be used deductively to improve the probability of Q; or that Q is so far more probable, and may be used to inductively to raise the probability of P. Tacitly, this signifies an argument with a necessary major premise, and a probabilistic minor premise and conclusion.

Similarly, by the way, for disjunctive argument. Premises and conclusion may have any degrees of logical probability. Also,

the minor premise may be implicit in the major, by virtue of our ordering the alternatives, from the most likely (mentioned first to attract our attention) to the least (relegated to the periphery of our attention); or from the least likely (because easiest to eliminate) to the most (the leftover alternative, when we reach the end of the sentence).

3. Weighting Evidence

We have thus far described adductive argument, but have not yet validated it. We have to explain why the probable conclusion is justified, and clarify by how much the logical probability is increased. The answer to this question is found in the hidden structure of such argument, the pattern of thought which underlies it.

a. Let us suppose that P1, P2,… Pn are the full list of all the conceivable theses, each of which is separately capable of implying Q, so that the denial of all of them at once results in denial of Q. This means:

> If P1, then Q; and if P2, then Q; etc.
>
> or, more succinctly,
>
> If P1 or P2 or… Pn, then Q.
>
> And, since the list is exhaustive,
>
> If not-P1 and not-P2 …and not-Pn, then notQ.

(i) In that ideal situation, we can say that if Q is found true, then each of P1, P2,… Pn has prima facie an equal chance of having anteceded that truth. We know at least one of them must be true (since otherwise Q would be false), but not precisely which. Each carries an nth part of the total probability which this necessity embraces. Thus, the degree of probability is in principle knowable, and the process justifiable.

If one of the alternative antecedents is thereafter found false, the number of alternatives is decreased, and so the probability of each of the remainder is proportionately increased. Where only one alternative remains it becomes maximally probable, that is,

necessary; and the conclusion is deductive rather than adductive or inductive (in the narrow sense).

In practice, we do not always know or consider all the alternatives; even when we think we are aware of them all, it may only be an assumption, a generalization. Still, the principle remains, even if the degree of probability we assign to the conclusion turns out to be inexact. This is because we are here dealing with logical probability, which is intrinsically tentative and open to change. That is just the function and raison-d'être of logical probability, to monitor the current status of propositions in an evolving body of knowledge.

(ii) If, not yet knowing whether Q is true or false, we find one of the alternatives, say P1, false, we can say that we are one step closer to the eventuality that all are false, from which the falsehood of Q would follow. In that case, the probability of Q being false has increased by an increment of 1/nth.

If thereafter say P2 is also found false, the chances of Q being false are further increased. When all the conditions of that event are fulfilled, the probability becomes maximal — a necessity.

b. In formal terms, what the above means is that 'If P, necessarily Q' is convertible to 'If Q, *(a bit more)* probably P'. Similarly, 'If P, necessarily Q' is invertible to 'If not P, *(a bit more)* probably not Q'. Even if we do not know what, and how many, are the other shareholders of the overall probability, these inferences retain their value.

In aetiological terms, we thus have two sources of probability increase. A thesis (here, P1 for instance) may be rendered more probable by the truth of another (viz., here, Q), of which it is an alternative contingent cause. Or a thesis (here, nonQ) may be rendered more probable by the truth of another (viz., here, not-P1 for instance), which is a component of a necessary cause of it.

Thus, more broadly, probability is transmitted across the logical relationship signified by hypotheticals: in both directions, from antecedents to consequents and vice versa, and to varying degrees, reflecting the intensity of the link.

Each such probability change is relative: it applies within that limited environment which we projected. In practice, the degree

of probability we assign to a thesis is a complex result of innumerable such incremental changes. Needless to say, when a thesis is strengthened, its contraries are proportionately weakened; and vice versa.

A thesis may be increasingly confirmed for a variety of reasons, and at the same time increasingly undermined for a variety of other reasons. What matters is its resultant probability, its overall rating, the sum and average of all the affirming and denying forces impinging upon it, at the present stage of knowledge development.

If follows that, though the alternative theses are, to begin with, of equal weight, they may, in a broader context, be found of unequal weight. In that case, we select the relatively most weighty, the logically most probable, as our preferred thesis at any stage of the proceedings.

All the above can be repeated with respect to disjunctions. Consider two or more theses, each with some degree of credibility from other sources. If they are found to be contrary, their credibilities are all proportionately lowered, since we know they cannot all be true. If they are found to be subcontrary, their credibilities are all proportionately raised, since we know they cannot all be false. However, in the case of exact contradictories, their independent credibilities are unaffected, since their mutual exclusion and exhaustiveness offset each other.

c. Lastly, note that we have to clearly discriminate between: exhausting the known possibilities, on the one hand, and open-mindedness to the eventual possibility that new alternatives be found one day, on the other hand.

At any given stage in the development of knowledge we have to bow to all the apparent finalities; this does not prevent us from accepting the principle that some correction might later be called upon. On the other hand, that attitude of receptiveness to change should not be allowed to belittle our trust in acquired certainties.

When all but one of the known theories concerning some phenomena have been eliminated, or one theory is shown to be their only conceivable explanation, we must accept our conclusion as final and unassailable, provided no inconsistency or specific cause for doubt remains. The truth that some such

certainties have in the past been overturned, does not logically imply that this particular certainty will ever be overturned.

There is a formal difference between the status of logical possibility within a context, and the general admission that context does change, which stands outside of any context. They are not identical in power: the former affects contextual reasoning, the latter plays no active part in deliberations, being only an open-ended philosophical truth without specific applicability.

We ordinarily think assertorically, in terms of statements like ‘if P, then Q’, meaning ‘if P is established, then Q may be claimed to be known’. But sometimes we remain dubious, and say ‘if perhaps P, then perhaps Q’. Some people reason in this manner more often than others, hanging on to uncertainties so insistently that they inhibit the forward motion of their knowledge.

But such reasoning, which may be called ‘problematic logic’, is essentially no different from assertoric logic. Its inferences are exactly parallel, the only difference is the explicit emphasis it puts on the probabilities of the theses.

Perhaps the legitimate context for such statements would be whenever we inquire into eventual developments of knowledge. Right now, say, P is to all appearances true; but there is always an off-chance that it might turn out not to be true, after all; in that case, we ask, *what would happen if* P was not true. We look ahead, even though we are without strict justification, in order *to be prepared* for eventual alternatives to ‘established fact’.

4. Other Types of Probability

As we saw in the discussion of *de-re* conditioning, adduction is also feasible using natural, temporal or extensional conditionals, but it must be stressed that the emergent probability is essentially in logical modality. We might call it para-logical probability, meaning not *purely* logical, if we wish to underline the faint difference, which relates to source of judgment.

a. A categorical proposition always has adductive implications. ‘Most (or Few) S are P’ is taken to imply ‘This S is probably (or improbably) P’; that is, for any random S, the logical probability is high (or low) that it will be P, in proportion to the quantity. We consider the likelihood that the given case of S happens to be one of those which are P.

Likewise, ‘This S is P in most (or few) circumstances’ implies ‘This S is probably (or improbably) P’ that, for any randomly chosen circumstance, there is a logical probability that this S will be P in it, commensurate with the number of natural circumstances favoring such event. We consider the likelihood that the given circumstance surrounding this S happens to be one of those in which this S is P. Similarly with temporal modality.

When two or more of the extensional, and natural or temporal, modalities are involved in a proposition, the logical effect is compounded. The logical probability is increased (or decreased) to some extent by each of the *de-re* modalities, and the resultant is whatever it happens to be.

b. Such transmission of logical probability, from a plural *de-re* proposition down *to a single-unit case* for the type of modality concerned, on the ground of a majority or minority of instances, circumstances or times — is also to be found with conditionals. The following are some typifying examples:

a. In **extensional** adduction:

Any S which is P, is Q,

and this S is Q — therefore, this S is probably P;

or: and this S is not P — so, this S is probably not Q.

b. In **natural** adduction:

When this S is P, it must be Q,

and this S is Q — therefore, it is probably P;

or: and this S is not P — so, it is probably not Q.

c. In **temporal** adduction:

When this S is P, it is always Q,

and this S is Q — therefore, it is probably P;

or: and this S is not P — so, it is probably not Q.

These concepts can be further broadened by reference to majoritive or minoritive conditionals, in arguments like the *de-re* adductions here shown, and likewise for corresponding apodoses. Some logical probability is still transmitted down from premises to conclusion.

Thus, if the major premises in such arguments had been the extensional 'Most (or few) S which are P, are Q', or the natural 'When this S is P, it is in most (or few) circumstances Q', or the equivalent temporal conditional — the conclusion would still have some degree of logical probability, proportionately to the numbers of instances, circumstances or times involved. Likewise, in cases of compound modal type.

If the minor premises were respectively of the form 'Most S are Q' (or 'Most S aren't P'), or 'This S is in most circumstances Q' (or 'This S is in most circumstances not P'), or the equivalent temporal categorical — a probable conclusion can likewise be drawn. Note, however, that if the minor premise is of low *de-re* probability, it does not follow that the conclusion is likewise of low probability; all we can say is that the conclusion has very slightly increased in probability. Likewise, in cases of compound modal type.

A probabilistic major premise, of any modal type or combination of modal types, together with a probabilistic minor premise, of any modal type or combination of modal types, yield a conclusion of some, though much diminished, degree of logical probability.

More broadly still, such conditional major premises, and indeed the minor premises, may have varying degrees of purely logical probabilities as propositions in a knowledge context, quite apart from the inherent 'para-logical' (*de-re*) probabilities just discussed. In that case, the resultant logical probability is still further diminished.

We can similarly adduce evidence through *de-re* disjunctive adduction, in each or any combination of these types of modality.

6. THEORY FORMATION

Drawn from Future Logic (1990), Chapter 47.

1. Theorizing

Every theory involves an act of imagination. We go beyond the given data, and try to mentally construct a new image of reality capable of embracing the empirical facts. The nimbler our imagination, the greater our chances of reaching truth. Think how many people were stumped by the constancy of the velocity of light discovered by the Michelson-Morley experiment, until an Einstein was able to conceive a solution!

Without creativity our understanding would be very limited. We need it both to construct hypotheses, and to uncover their implications. Neither of these achievements is automatic. Conceiving alternatives and prevision both involve work of imagination.

In practice, no theory is devoid of hidden assumptions, besides its stated postulates. We may try to be as explicit as possible, but often later discover new dependencies. Thus, with Newton's assumption of Euclidean geometry, which was much later discarded in the General Relativity theory.

Thus, our theorizing is always to some extent limited by our ability to make mental projections, and the depth and breadth of our conceptual insight.

These faculties of course depend very much on the mind being fed by new empirical input. Creativity depends on the ideas provided us by new experience, and revision of fundamentals depends on the stimulus of discovered difficulties.

Each individual has his own limits. People often remain attached to preconceptions, and are unable or refuse to consider alternatives. This can be a weakness or vice, but it is also a normal part of the way the mind works.

We have to hold something steady while considering the impact of new perspectives. We cannot re-invent the wheel all the time,

without justification. We review our presuppositions, only when the need arises, when some empirical problem presents itself.

This does not exclude 'art for art's sake'. The pursuit of theoretical improvements is always permissible. But it is anyway serial. We are mentally unable to change all our knowledge at once, but are forced to proceed in an orderly, structured manner, gradually focusing on this or that proposed change while the rest is taken for granted.

Logical and mathematical skills also count for much in the development of theories. Many a wild speculation is built on unsound reasoning. These skills include, among many others: clarifying inter-relationships, finding analogies and implications, distinctions and contradictions, ordering information.

A good grasp of the methodology of adduction is very important. It opens minds to the ever-present possibility of alternative explanations and further testing. Adduction is essentially a process of trial and error.

The tentative, and often transient, nature of theories, as well as their ability to make impressive predictions, has been exemplified in some stunning scientific revolutions in the past few centuries. Even seemingly unshakable theories have been known to fall, and some of the discoveries occasioned by the new perspectives would have seemed unthinkable previously.

There is much to learn by observing the 'life' of theories, their historical courses, the ways they have augmented or displaced, complemented or contested, each other, their dynamics.

2. Structure of Theories

Any one general proposition can of course be viewed as in itself a theory, and the processes of generalization and particularization are samples of adduction. The relation of a general proposition to particular observations, is logically one of antecedent and consequent, though the chronological order may be the reverse.

However, we normally use the term ‘theory’ in larger, more complex, situations. We think of a rational system for understanding some subject-matter. The sciences of course consist of theories, which attempt to explain the empirical phenomena facing them. But we also build small personal theories about events in our lives of concern only to ourselves.

Let us examine the structure of theories. A ***theory*** (say, **T**) consists of a number of conceptual and/or mathematical propositions. Among these propositions, some cannot be derived from the others: they may be called primary; the others, being of a derivative nature may be called secondary. The derivation, of course, is supposed to be logically or mathematically flawless.

Among the primary propositions, some are distinctive to that theory: they are called its ***postulates*** (label these **p1**, **p2**, **p3**, etc.). Postulates should be as limited in number, as simple in conception and broad-based, as we can make them. Though postulates may be particular (as for instance in a theory concerning historical events), the postulates of sciences are normally general propositions. These are usually obtained by generalization from directly observable particulars, but not always (consider, for instance, the idea of curved space).

If a primary proposition is not distinctive to that theory, but found in all other theories of the subject under investigation, then it is not essentially part of that specific theory, but stands outside it to some extent. Such external primaries may be transcendent axioms, or they may be borrowed from some adjacent or wider field of investigation, taken for granted so long as that other theory holds.

The secondary propositions are called the theory’s ***predictions*** (label these **q1**, **q2**, **q3**, etc.), even if not distinctive to that theory.

Some predictions are testable, open to empirical observation, perhaps through experiment; some predictions are intrinsically difficult to test. To the extent that a theory offers untestable predictions, it tends to be viewed as speculative. Among the testable predictions, some are normally already tested: they provided the raw data around which the theory was built; others may be novel items, which anticipate yet unobserved phenomena, providing us with opportunity for further testing.

Predictions are derived from the postulates by a process of production, mediated by the relatively external primaries. We regard the external primaries as categorical, as far as our theory is concerned, so that they may remain tacit, though they underlie the connections between our postulates and predictions.

Thus, postulates are hypothetically linked to predictions, in the way of antecedent to consequent. The antecedent need not include the external primaries, since the latter are considered as affirmed anyway, and were used to establish the connection. For example, Newton's laws of motion were the postulates distinguishing his mechanics, while his epistemological, ontological, algebraic and geometrical assumptions lay outside the scope of his theory as such.

Theories often draw on findings in other domains outside their direct concern, and may have powerful repercussions in other domains. Thus, Newton had to develop calculus for his mechanics; this mathematical tool might well have been researched independently, as indeed it was by Leibnitz, but it was also stimulated or given added meaning when its value to physics became apparent.

A theory, then, may be described as follows, formally:

T = If p1 and p2 and… , then q1 and q2 and…

Note that this overall relation may in some cases be supplemented by narrower ones. It may be that all the postulates are required to make all the predictions; or it may be that some of the postulates are alone sufficient to make some of the predictions.

3. Criteria

Theories serve both to explain (unify, systematize, interpret) known data, and to foresee the yet unknown, and thus guide us in further research, and in action. The criteria for upholding a theory are many and complex; they fall under three headings:

a. Criteria of ***relevance***. A theory may be upheld as possibly true, so long as it is meaningful, internally consistent,

applicable to (i.e. indeed implying) the phenomena under investigation, and consistent with all other observation to date.

This possibility of truth signifies no more than that the theory is conceivable, and has some initial degree of probability. This may be called relevance.

b. Criteria of ***competitiveness***. But the work of induction is not complete until the theory has been compared to others, which may be equally thinkable and defensible in the given context. Induction depends on critically pitting theories against each other.

Two or more theories may each fulfill the conditions of relevance, and yet be incompatible with each other. They might converge in some respects, having some postulates and/or predictions in common, but found divergent in other respects.

It might be possible to reconcile them, finding postulates which succeed in encompassing the ones in conflict, while retaining the same uniform predictions. Or we may have to find exclusive predictions for each, which can be tested empirically to help us make a choice between postulates.

This is where adduction comes into play. It is the process used to evaluate, compare, and select theories through their predictions. It is the main tool for the induction of theories, commonly known as 'the scientific method'.

c. ***Utilitarian*** criteria. Although utility is a relatively 'subjective' standard for evaluating theories, being man-centered, it plays a considerable role. For us, knowledge is not a purely theoretical enterprise, but a practical necessity for survival. We use it to support and improve our lives.

We judge a theory to some extent by how accessible it is to our minds, by virtue of its simplicity, or the elegance of its ordering of information. All other things being equal, we would choose the theory which approaches this ideal most closely, on the general grounds that the world is somehow simple and beautiful. The onus of proof is on the more complex, the more *'far-fetched'*, theories: avoidable complications need additional justification.

However, simplicity should not be confused with *superficiality*. People often opt for overly simplistic viewpoints, which only take the most obvious data into consideration, and ignore deeper issues. A theory should preferably be simple, but not at the expense of accuracy; it must cover more known phenomena and answer more questions, than any other, to be credible. The easy solution often has a limited data base, and reveals a *naive* outlook.

Apart from such rationalistic and esthetic bias, we also look at the implementation value of a theory. Even if a theory or group of theories is/are known to contain some contradictions, we may hang on to them, in the absence of a viable substitute. We assume that the problem will eventually be resolved; meanwhile, we need a tool for prediction, decision-making and action, however flawed. Thus, for example, with the particle-wave dichotomy in physics.

We will look at some of the dynamics of theory selection in more formal terms, in the next chapter.

4. Control

It must be stressed that the primary problem in theorizing is producing a theory in the first place. It is all very well to know in general how a theory is structured, but that does not guarantee we are able to even think of an interpretation of the facts. All too often, we lack a hypothesis capable of embracing all the available data.

Very often, theories regarded as being ‘in conflict’, are in fact not strictly so. One may address itself to part of the data, while the other manages to deal with another segment of the data; but neither of them faces all the data. Their apparent conflict is due to their implicit ambition to fit all the facts and problems, but in reality we have no all-embracing theories before us.

However, quite often, we do easily think up a number of alternative theories. In that case, we are wise to resort to *structured theorizing and testing*, to more clearly pose the problems and more speedily arrive at their solutions.

This is known to scientists as ‘controlled experiment’, which consists in changing (by small alterations or thorough replacement) one of the variables involved, while ‘keeping all other things equal’. The method is applicable equally to forming theories and to testing them (by simple observation or experiment).

Structuring consists in ordering one’s ideas in a hierarchy, so as to systematically try them out, and narrow down the alternatives.

a. List the independent *issues*. A subject-matter may raise several questions, which do not seemingly affect each other; these various domains of concern must first be identified. For example, in geometry, whether or not space is continuous, and whether or not parallels meet, seem to be two separate issues.

b. For each issue, list the alternative postulates, which might provide an answer. Combine the various postulates of each issue, with the various postulates of all other issues involved, to yield a number of theories (equal to the product of the numbers of postulates in the various issues). Some of these combinations may be logically inconsistent, and eliminable immediately; in other words, there may be some partial or conditional dependencies between the issues.

c. Within each issue, distinguish between alternative postulates which are radically different, and between postulates which may be viewed as minor alterations of one common assumption. In the former case, we may expect to eventually find some radically different predictions from the alternative postulates. In the latter case, varying the main postulate may merely cause small variations in the predictions, and the work involved is more one of fine tuning our theory.

d. The best way to test ideas is to organize them in terms of successive specific theses and antitheses, as follows:

Starting with the seemingly broadest, most independent issue, focus on one postulate p1, and find for it a prediction q1, which is denied by the denial of that postulate, thus:

If p1, then q1, but if not p1, then not q1.

Next, suppose that p1 wins that contest, and concentrate on the next issue; within that issue, consider one postulate p2, and again look for some exclusive prediction q2 for it:

If p2, then q2, but if not p2, then not q2.

Proceeding in this manner, we can gradually foresee the course of all possible events, and eventually of course test our results experientially. This is an ideal pattern, in that it is not always easy to find such distinctive implications; but it often works.

The trick, throughout the process of theorizing and testing is to structure one's thoughts, so as to advance efficiently to the solutions of problems. A purposeful, constructive, orderly approach, is obviously preferable to a hesitant, vague, muddled one. It often helps to use paper and pencil, or computer, and draw flow-charts; it generates new ideas. Sometimes, of course, it is wise not to insist, and to let the mind find its way intuitively.

I would like to here praise the inventors and developers of the modern personal computer, and all software. Imagination and verbal memory greatly improve the mind's ability to formulate and test thoughts. The invention of the written word, and pen and paper to draw and write with, provided us with an enormous expansion in these capabilities.

The word-processing and other computer applications increase our mental powers still further, by an enormous amount. A patient person can keep improving ideas on a screen, again and again, to degrees which were previously beyond reach. This has and will make possible tremendous advances in human thinking.

7. THEORY SELECTION

Drawn from Future Logic (1990), Chapter 48.

1. The Scientific Method

The 'scientific method' consists in trying out every conceivable imaginary construct, and seeing which of them keep fitting all new facts, and which do not. Those which cease to fit, must be eliminated (or at least corrected). Those which continue to fit, are to that extent increasingly probable, until they in turn cease to fit. Whatever theory alone survives this eliminative process, is effectively proved, since all the shares of probability have been inherited by it.

In practice, the construction of alternative postulates, and the discovery of the full implications of each, are both gradual processes. We do not know these things immediately. Also, the given context is not static, but itself grows and changes as we go along. This feeds our imagination and insight, helping theory developments, and stimulating further research.

We may start with one or two partially developed theories, and slowly find additional alternatives and make further predictions, as events unfold and the need arises. The extent of our creative and rational powers affects the exhaustiveness of our treatment.

Several theories concerning some group of phenomena may, at any stage in the development of knowledge, simultaneously equally fulfill the criteria of relevance; namely, conceptual meaningfulness, internal consistency, ability to explain the phenomena in question, and compatibility with all other empirical givens so far.

In formal terms, this simply means that competing theories T1, T2, T3,… may, while being contrary to each other, each still logically imply the already experienced phenomena Q. That is, the hypotheticals 'if T1, then Q', 'if T2, then Q', etc., are formally compatible, even though 'T1 or else T2 or else T3…' is true.

The statement that our list of theories for Q is exhaustive, has the form 'If T1 or T2 or T3… , then Q', plus 'one of T1, T2, T3… must be true'. Although it may be hard to prove that our list is exhaustive, we may contextually assume it to be so, if every effort has been expended in finding the alternative explanations.

Each theory contains a number of postulates: T1 = p11 + p12 + p13 +…, T2 = p21 + p22 + p23 +…, and so on. Some of these postulates might well be found in more than one theory; it may be, for instance, that p13 = p29 = p36. But each theory must have at least one distinctive postulate or a distinctive combination of postulates, which makes it differentiable from all the others.

Also, the phenomenon or group of phenomena labeled Q are already known empirically, and supposed to be equally embraced by the various theories put forward. But each theory may have other implications, if we can determine them through reason, open to empirical testing, though not yet tested.

Each theory has a set of predictions: T1 = q11 + q12 + q13 +…, T2 = q21 + q22 + q23 +…, and so on. Some of these must be in common, constituting the given phenomena Q which gave rise to our theorizing in the first place. That is, say, Q = q15 = q27 = q31.

The rest may likewise be all identical, one for one; or some overlaps may occur here and there, while some predictions found here are missing there; or, additionally, some conflicting predictions may occur, so that one or more theories affirm some prediction that certain other(s) deny.

In principle, it is conceivable that the various theories all make only the same predictions, in which case they are factually indistinguishable, and we cannot choose between them on an empirical basis, though we may still refer to utilitarian criteria.

Most often, however, we may eventually find distinctive further predictions for each theory, or at least some which are not common to all. A difference in postulates usually signifies a difference in predictions. Here, we must be careful to differentiate between:

a. a prediction implied by, say, T1, but neither implied nor excluded by T2, T3, etc. — if such a prediction passes the test

of experience, T1 is confirmed, but T2, T3,… are neither confirmed nor rejected, though their probabilities are diminished by the increased probability of T1; whereas if such a prediction fails the test of experience, T1 is rejected, while T2, T3,… become more probable by virtue of being less numerous than before; and:

b. a prediction implied by, say, T1, and logically excluded by T2, T3, etc. — if such a prediction turns out empirically successful, T2, T3… are rejected, and (if only T1 is leftover) T1 is proved; whereas if such a prediction turns out empirically unsuccessful, T2, T3,… are confirmed by their anticipation of the negative event, while T1 is rejected.

Thus, theory selection depends on finding distinctive predictions, which can be used in adductive argument or apodosis. These should be empirically testable predictions, of course.

If one or more theories have an implication which the others lack, though are compatible with, or if one or more theories have an implication which the others are incompatible with — we have at least an eventual source of divergent probabilities, allowing us to prefer some theories over others, even if we cannot eliminate any of them; and in some cases, we may be able to eliminate some of them, and maybe ultimately all but one of them.

These methods are of course well known to scientists today. But all this concerns not only scientists at work, but the development of opinions by individuals in every domain. It is the ‘trial and error’ process through which we all learn and improve our knowledge.

Even if at a later stage we might manage to validate some of our beliefs more deductively and systematically, this is the method we usually use to initially feel our way to them and develop them. Knowing the ‘scientific method’ explicitly and clearly can help individuals to make their personal thinking on topics remote from abstract science more scientific.

2. Compromises

We have described the ideal pattern of scientific evaluation of theories; but, in practice things are not always so neat, and we often have to make do with less than perfect intellectual situations.

a. For a start, the coexistence of conflicting theories may be viewed less generously as a source of doubt for all of them; they may each be corroborated by the delimited data they explain, but their mutual incompatibility is a significant inconsistency in itself.

We may remain for years with equally cogent, yet irreconcilable theories, which we are unable to decide between. Our minds are often forced to function with a baggage of unresolved contradictions.

In such case, we suspend judgment, and make use of each theory for pragmatic purposes, without considering any as ultimately true as a theoretical image of reality.

Even as we may give more credence to one theory as the more all-embracing and most-confirmed, or as the simplest and most-elegant, we may still withhold final judgment, and not regard that theory as our definite choice, because the evidence does not seem to carry enough conviction.

b. Sometimes the available theories only partially explain the given data. They may embrace some details in common, with comparable credibility, but one may be more useful than the others in some areas, while another is more thorough in other respects.

Although this suggests that the theories have distinct implications, they are each supportable on different grounds, perhaps with the same overall probabilities. We may not find a way to choose between them empirically, or to unify them somehow.

In such case, narrowing the field by elimination of alternatives is hardly our main concern; rather, we are still at a stage where we need a unifying principle, we effectively do not have a theory in the full sense of the term. An example of this is the particle-

wave dichotomy, and the search for a unified field theory to resolve it.

Sometimes, we know our list of available theories is faulty, because their connections to the data are not entirely satisfactory and convincing. In that case, our 'if-then-' statements are themselves probabilistic, rather than necessary. Our ideas then had better be called notions or speculations.

c. Sometimes, no theory at all can be found for the phenomena at hand, for years. There may be seemingly insurmountable antinomies. We are forced to wait for an inspiration, a new idea, a new insight, a new observation, which might lead us to a satisfactory solution.

Because it is in some domains very difficult to develop a meaningful and consistent conceptual framework, we may be forced to accept one which is conceptually or logically flawed, as a working hypothesis.

Sometimes, the problem may be shelved, because its impact lies elsewhere, creating doubts and questions in distant disciplines. For example, Heisenberg's Uncertainty Principle seems to assault our common-sense conceptions of determinism for inanimate matter: this might later be resolved by Physics itself, or might remain an issue for Philosophy to deal with.

In practice, an imperfect tool of knowledge is often better than none at all. We prefer to have a theory formulated in terms of vague or seemingly contradictory concepts, with practical value, than to remain paralyzed by a dogmatic insistence on an elusive ideal.

d. Thus, sometimes, although a theory may apparently be strictly speaking felled by hard evidence, and we are unable to pinpoint its mistakes, we may nonetheless pragmatically hang on to it, if there is no other to replace it. We simply mentally attach a reservation to it, retain an awareness of its limitations, and move on cautiously to practical applications.

This is especially justifiable when the reason for its empirical rejection was an extreme situation, or 'boundary case', not encountered in the normal course of events. We then recognize the need to specify some limiting conditions to the theory,

without being able to fulfill this need more precisely at the present stage.

3. Theory Changes

Even when a theory is found empirically wrong, yet has alternatives, we may avoid outright rejection, and rather first seek to rectify it somehow, limiting it in scope or shifting some of its postulates slightly. This is feasible on the ground that there must have been some grain of truth in the original insight, and we may be able to tailor our assumptions to fit the new data.

Even if we cannot immediately conceive a correction, we may still choose to hang on to the original idea in the hope of its eventual redemption. We all carry a baggage of beliefs through life, which we know lead to contradictions or have been apparently disproved or rendered very improbable; we keep them in mind for further verification, anyway. This attitude taken to an extreme is of course contrary to logic, but within reasonable bounds it has some utility.

The pursuit of truth is not cold and vengeful, as it were, towards flawed theories, intent on rarefying the alternatives at all costs. Rather, it is a process of flexible adaptation to changing logical conditions. Our goal is, after all, to indeed arrive at truth, and not merely to give the impression that we did.

If we manage to modify a theory well enough to fit the new facts, then effectively we have developed a new theory. It may be a new version of the old, but still merits consideration as a theory in its own right.

We defined a theory as a number of distinctive postulates together implying a number of predictions. More loosely, the range of applicability of a theory might be varied, without radically affecting the substance of its proposals or its details.

Also, we may distinguish between essential postulates and postulates open to change. The former may be generic proposals, the latter specifics within them which we have not yet resolved — postulates within postulates, as it were. Likewise, we might distinguish between generic predictions, which are necessary

consequences, and their specifics, which may be less firmly bound to the postulates.

With these thoughts in mind, we can talk of a theory ‘changing’, while remaining essentially the same theory. This may refer to changes in scope or changes in detail which do not affect the main thrust of a hypothesis. In other words, a theory may involve logical conditional propositions, as well as categoricals, leaving room for variations.

Denial of a postulate may mean: either denial of the broadness of the postulate, without excluding the possibility that a more moderate formulation is acceptable, or denial of a specific position, which can be replaced by another specific position with the same generic impact, or radical denial of a generic position, in the sense that all its possible embodiments are consequently denied.

Denial of a prediction may accordingly either merely cause us to regard the theory as having a more limited applicability than originally thought, or to make relatively small corrections in our assumptions, or force us to formulate a completely new theory.

Thus denial of a postulate or prediction does not necessarily mean rejection of the whole theory as such, it may be only partly discredited, requiring a less ambitious or a slightly altered formulation.

Accordingly, a new theory may totally replace an old one, or it may embrace it as a special case. For example, Einstein’s Relativity resulted in our particularization of Newtonian mechanics to commonplace physical levels; it was thenceforth seen as inapplicable to more extreme astronomical or sub-atomic situations, but retained much of its usefulness.

4. Exclusive Relationships

We know from apodosis that affirmation of a postulate implies acceptance of all its necessary predictions (even those untestable empirically), and denial of a prediction obliges us to reject (or at least change) the postulates which necessitate it.

Denial of a postulate does not engender denial of its still untested predictions; it only diminishes their probability. However, empirically untestable predictions can still be discarded, if we can show them to be logically exclusive to some empirically rejected postulate(s). The argument is a valid apodosis:

> *Only if* postulates p, then predictions q
>
> (implying: if notp, then notq),
>
> but not p,
>
> hence, not q.

Doubt may remain, depending on how sure we are of the postulate's denial, and especially on the strength of the exclusiveness. Also, what has been said does not prevent the possibility that a slightly different version of the predictions still holds.

Likewise, affirmation of a prediction does not in itself prove any of the postulates giving rise to it, but only confirms them. However, theoretical postulates can still be established, if we can show them to make some logically exclusive empirically tested prediction(s).

> *Only if* postulates p, then predictions q
>
> (implying: if notp, then notq),
>
> but q,
>
> hence, p.

This too is a valid apodotic argument. Again, such exclusiveness may often be hard to determine indubitably, but the principle remains valid.

It is not always easy or even possible to find such exclusive relationships. In such case, we are of course limited to the adductive approach. Note that, just as necessity is the extreme of probability, so apodosis is the limiting case of adduction: they differ in degree, not in essence.

Thus, it is not permissible to regard, as some philosophers seem to have intimated, science as incapable of certitude in disproof of empirical matters, or of certitude in proof of theoretical constructs. Admittedly, a good deal of theory selection is based on the processes of adduction and elimination; but this is only one arrow in the arsenal of the scientific method.

If we regard science as capable of establishing logical (or mathematical) connections for the purposes of mere confirmation or undermining of theories, then it is equally capable in principle of establishing exclusive connections which can be used for the above described demonstration purposes.

All the hypothetical forms are structurally identical, irrespective of the polarities of their theses. If any one of them is recognized as accessible to science, then they are all equally so. If we can rely on the 'if p, then q' of adduction, then we can just as well rely on the 'if notp, then notq' of exclusive apodoses.

There is no intent, here, to underrate the importance of competitive induction, only to point out that other, more certain, means are *sometimes* available to us, though not always. What is at issue here is the suggestion that we only have a choice of a-priori, axiomatic knowledge versus a posteriori, probabilistic knowledge.

There is an in-between alternative: knowledge which is at once theoretical, and certifiable, and empirical. It is arrived at through the logical discovery of exclusive relationships between postulates and predictions. This methodology has the stamp of approval of logical science, and is perfectly reliable.

Indeed, all our so-called mind-set concepts, even the axioms of logic, have such exclusive-empirical grounding, as well as self-evidence (i.e. self-contradiction of their contradictories). Every particular proposition, for example, appeals to this reasoning. More generally, any concept which appears as sole available interpretation or explanation of the experienced phenomena is justifiable on that basis.

8. SYNTHETIC LOGIC

Drawn from Future Logic (1990), Chapter 49.

1. Synthesis

Knowledge requires inquisitiveness and creativity. It cannot advance far inertially. The role of the knower is to actively ask questions and look for answers, not to sit back passively and assume all is well. Knowledge is a *constructive* activity.

In forming one's opinions, one has to *think things through*, and not unfocus one's stare and avoid the effort. One should not rely excessively on generally-held opinion, though of course its general acceptance is in most cases well-earned. One is duty-bound to verify, repair, and contribute, if one can.

Knowing is not mere maintenance work, 'when something goes wrong, fix it', but involves searching for flaws or improvements even without apparent cause. Speculation, the attitude of 'what if things are otherwise than they now seem or are said to be?', has considerable value in the pursuit of truth.

In forming our world-view, we all make use of some prejudicial ideas, or preconceptions. We take for granted many basic assumptions, often unconsciously, without awareness of having made them, without ever having analyzed them to any great extent, without having tried the alternative assumptions.

Some such assumptions become deeply ingrained in a sub-culture, a culture, a period of history, or all human thinking. If such a philosophical prejudice is institutionalized, it is called a dogma. But our concern here is also with unconscious dogmas. My purpose in this chapter is to show informally how such ideas can be brought out into the open and evaluated.

The first thing is always a willingness to face the issue explicitly, and confront the possibly unpleasant results. Next, try to reconcile the apparent opposites, find a *synthesis* of some sort. Look for the ultimate premises, and even if speculatively,

consider alternative conceptions which are capable of fitting the known facts.

The synthesis of knowledge is an attempt to 'wrap it all up', or at least take stock of the situation as a whole thus far. You lay out the data you have, and you firmly evaluate their significance on your current opinions:

- Where are you at?
- What do you know, what don't you know?
- What do you need to know?
- What can you know, what can't you know?

An inventory and a summation, to the best of one's ability.

2. Self-Criticism

Thus far, one's logic may have been lenient. One perhaps wanted to get ahead, to cover ground. There was no time for scrupulous analysis of the degrees of logical probability in one's information and inferences. Now, the whole must be reviewed, each part considered in the light of all the others. One must disengage oneself, and become a neutral referee between contending ideas.

One must challenge one's previous viewpoints. One must look at things *more critically*, less intent on the object than on the process which led us to our viewpoint. It is time to linger on detail, digress a little, consider the full impact of what one is saying.

This may mean taking-off in all directions, even to the point of looking into metaphysical implications. One should not limit one's vision to one field, but range as far and wide as necessary to prove a point. One may appeal to epistemological reasons, or consider ontological outcomes.

Initially, we accept our deductions and inductions with fair-minded tolerance. But, in the final analysis, the limits of one's certainties must be emphasized. There are different degrees of strictness of outlook; different modalities of implication. There is a 'take it for granted', working level; and there is a more severe, philosophical level.

Within philosophy, ‘anything goes’, and even doubts about logic, about the laws of thought or the trustworthiness of experience, have some legitimacy. At this strict level, it is healthy to give skepticism some rein, to enable us to judge with honest detachment (though total skepticism remains invalid, since paradoxical).

For instance, an adductive argument is ordinarily allowed; it is acknowledged to increase the probability of the conclusion. But viewed deductively, its inference is worthless. Synthetic logic probes into theories by considering, not only their internal consistency and continuing confirmation, but more fully and deeply:

- What are the ultimate assumptions?
- What are the implied conclusions?
- Are there alternative premises or inferences?
- How do they compare and contrast, how much do they agree or disagree?
- How reliable are the apparent consistencies and how serious are the seeming inconsistencies?
- How solid are the logical connections between postulates and predictions, and what are they based on?
- What is the data, and how empirical is it?

The enterprise of science is an open pursuit of knowledge. If it is objective, as it wants to be, then it should have no prejudice as to what the object presented to it is, or how it got there. The process of adduction, we saw, has the form:

> If Theory, then Predictions:
> Yes to any of these predictions,
> therefore, possibly yes to the theory.
> (but if No to any prediction, no to the theory.)

This may be countered by the equally valid adduction:

If Other Theory, then Same or Other Predictions:
Yes to any of those predictions,
therefore, possibly yes to the other theory.
(but if No to any prediction, no to the theory.)

Now, note the following methodological implications, according to strict logic. Here, the emphasis is more on the criteria of relevance and competitiveness. Utilitarian or esthetic criteria are not granted much weight, so that a far-fetched theory may be as respectable as a more obvious one.

i) If the two theories make predictions which coincide exactly, or if none of their predictions logically impinge on each other, there is no way to choose between them. They are effectively undifferentiated, or irrelevant to each other.

ii) If the two theories have some different prediction(s), but these differences are in practice or in principle untestable, again there is no ground for preferring the one to the other. But we may not regard untestable predictions as strictly logically equivalent to non-predictions.

iii) If the two theories have been confirmed by adduction to an equal degree of logical probability — that is, as many times, by equally firmly-implied and credible phenomena, whether these phenomena be the same or different — no conclusion is permissible. The logical modality is the same.

All this applies as well to theories with mutually exclusive postulates, and to theories with postulates which are independent of each other.

3. Fairness

Clearly, the mere fact that someone takes up a theory of his own, and keeps testing it, and finds it repeatedly confirmed, does *not* in itself make his work fully scientific, and in accord with the neutral demands of logic.

The scientific approach, under the terms set by epistemology (*not* ontology, mind you), is to consider all other available theories, and busy oneself to an equal extent in testing and confirming *them too*. If difficulties arise, we are duty-bound to try to repair *all* the known theories with equal zeal, and not just the one we hope will win, for whatever personal reasons.

The same methodological demands should be made for one's own pet theory, as one makes for others'; and the same leniency should be granted to others' theories, as one grants to one's own.

Similarly, one should refrain from negative pronouncements on sectors of human inquiry about which one is not adequately informed. In other words, one may regard oneself as a specialist, advancing a limited domain of the inquiry, without laying claim to any authority beyond those limits.

To be professional in the pursuit of knowledge, completely objective and neutral, without prejudice, one must proceed in accord with the rules of argument set by logic. The scientist who merely works on one theory at a time, without regard to the inadequacy of his methodology, is kidding himself and everyone else; he has ignored the alternatives, his conclusions are strictly invalid.

Of course, one can only do one thing at a time; but one must always keep the global perspective in mind, or refrain from comment.

> We can use the story of Galileo (as I was taught it at school) to give an example of synthesis. Until Galileo's time, people believed that our planet was the center of the Universe (comprising all the heavenly bodies - Sun, Moon, Planets and Stars); then, various observational and theoretical discoveries changed our picture of things, and the Sun became central (to our solar system, at least). This was initially received very harshly by a certain religious establishment; everyone knows the story. Today of course, after the Relativity theory, the issue is irrelevant to astronomy.
>
> Now, I have no personal attachment to the pre-Galilean thesis, nor does my religion advocate it — the spiritual centrality of mankind has nothing to do with the physical

position of planet Earth. However, it seems to me that the argument was in any case fallacious. For the new theories only posited that the mathematical formula describing the movement of the Planets around the Sun was much simpler than the formula which placed Earth at the center of things — but that did not prove that the latter more complex equations could not be formulated.

If I am not mistaken, every trajectory can in principle be 'turned on its head', and described mathematically from any point of origin. Simplicity is an inductive criterion, but it is never ontologically unassailable. Thus, it is ironic Galileo was in fact not even a threat to the world-view of the Inquisitors. For me, this example illustrates the need to always clarify the precise degree of conflict between theses.

9. ACTUAL INDUCTION

Drawn from Future Logic (1990), Chapter 50.

1. The Problem

Induction is the branch of Logic concerned with determining how general propositions — and, more broadly, how necessary propositions — are established as true, from particular or potential data.

By ‘actual induction’, I mean induction of actual propositions; by ‘modal induction’, I mean induction of modal propositions (referring to *de-re* modality).

We saw, in the analysis of Deductive processes, that although we can infer a general or particular proposition from other general propositions, through opposition, eduction or syllogism, it seems impossible to deductively infer general truths from particular ones only.

Indeed, it is even, according to the rules of syllogism, just about impossible to deduce a particular proposition from particular premises only: there has to be a general premise; the only exceptions to this rule are found in eduction, and in a limited number of third figure syllogisms, which allow us to obtain particular conclusions without use of a general premise: but these are too special to be claimed as important sources.

If, then, virtually all deduction presupposes the prior possession of general premises, where do these first general premises originate, or more precisely, how are they themselves shown to be true? Obviously, if such first premises, whatever their content, are open to doubt and of little credibility, then all subsequent deduction from them, however formally trustworthy, may be looked upon with healthy skepticism. As computer programmers say, “Garbage in, garbage out,” Conclusions drawn from spurious premises could nonetheless be true, but it would be mere chance, not proof.

Furthermore, these 'first general premises' we mentioned are not few in number. We are not talking here of a few First Principles, like the axioms of logic, from which exclusively all knowledge is to be derived. We require an extremely large number of first general premises, with all sorts of contents, to be able to develop a faithful image of our actual knowledge base. While mathematical sciences, like arithmetic, algebra or geometry, can seemingly be reduced to a very limited number of axioms, this is a feat not easy to duplicate in sciences like physics or psychology, or in everyday thinking.

If, now, we introspect, and observe our actual thinking processes as individuals, and analyze the actual historical development of Science, the accumulation of knowledge by humankind as a whole, we see clearly that, although deduction plays a large and important role, it is not our only source of knowledge. Even axioms in mathematics have been identified over time, and been subject to improvement or change. In practice, however faultless our deductions, our knowledge is clearly an evolving, flexible, thing. Ideas previously ignored, eventually make their appearance in our body of knowledge; thoughts once considered certain, turn out to be incorrect, and are modified or abandoned.

The primary source of knowledge is not deduction, but *observation*. This term is to be understood here is its broadest, and most neutral, sense, including both passive experiences and those experimentally generated.

Observation is to be understood as in itself a neutral event. It is consciousness, awareness, of appearances, phenomena, such as they present themselves, without judgement as to their ultimate meaning or value in the full scheme of things. Observation concerns the given, in its most brutal, unordered, unprocessed form.

Any *interpretation* that we attach to an observation, is to be regarded as a separate phenomenon; the distinction between these two is not always easy to make, nevertheless. Interpretation, in contrast to observation, attempts to relate phenomena, to place them in a supposed order of things, to evaluate their credibility and real significance in the widest possible context. It is a relatively complex mental process, and

more subject to error. Its purpose is to tell us whether, all things considered, an experience was illusory or real.

2. Induction of Particulars

In this treatise, I will evolve an original theory of induction, in considerable detail, with reference to categorical propositions: first for actuals, then more broadly for modals. I will not here deal with natural, temporal, or extensional conditionals, at all, but it will become obvious that the same methods and principles can be extended to those forms as well, though the formulas involved are bound to be enormously more complex; I leave the task to future logicians with my compliments!

The first step in induction is formulation of particular propositions on the basis of observation. This is a more complicated process than we might at first sight suppose. It does not merely consist in observation of a perceptible phenomenon, but includes the conceptual factor of abstraction of 'universals', the similarities on which we base our verbalization of terms, copula, and particular quantity. Pure observation forms no judgement; it is meditation on, simple consciousness of, the object at hand. The moment a thought is expressed, even a particular proposition, we have interpretation, conceptual correlation. The question of truth or falsehood is yet a separate judgement.

It follows, in passing, that a particular proposition based on observation of concrete phenomena, cannot be viewed as extremely superior in value to one based on observation of abstract phenomena. Both involve abstraction of sorts and verbalization. Their difference is only in the qualitative character of object involved, in the relative accessibility of the evidence.

Now, all observation concerns primarily individual instances. We have seen that singular propositions point to a single specific individual under consideration (referred to by 'this'), whereas particular propositions are quantitatively indefinite and need not specify the individuals they concern (we just say 'some'). A plural but specific proposition, involving the quantity 'these', is essentially singular in nature, or a conjunction of singulars; it

differs from a genuine particular, which is more broadly intended. We have seen, too, that singulars imply particulars, by formal opposition.

Normally, unless the subject is a nameable individual person or animal, a uniquely complex entity we deal with on a regular basis, our singular propositions are only temporary furniture in our knowledge base. I may say to you "look, this rose, unlike the others in my garden, is blue' or "this particle swerved to the left in our experiment," but ultimately, the individual is ignored or forgotten, and only an indefinite particular proposition is retained in the record. Furthermore, although a particular can be inferred from one singular, it is more often based on a plurality of observations.

In any case, induction of a particular proposition is free of generalization. It is observed that some S are P, so we say 'Some S are P'. If some S are scrutinized and observed not to be P, we say 'Some S are not P'. If no observation has been carried out, our faculties being shut off to the question, or the objects concerned being inaccessible to direct observation, or indirect observation (experiment through instruments), no inductive conclusion is drawn. We may still infer this or that particular deductively, of course.

3. Generalization

The induction of general propositions, however, occurs by generalization. This obviously does not concern special cases where full enumeration is possible, as in 'all these S are P', or in cases where the subject class is very prescribed so that 'all S' is an accessible number of instances; here, the general proposition can be viewed as effectively singular in nature. Normally, a general proposition is open-ended, and the number of instances involved extremely large (e.g. all the insects in the world), and inaccessible to observation (for example, having existed in the past, or yet to be born). Here, we tend to extrapolate from known instances, to the unknown. We predict many other phenomena, from a limited number of observed phenomena.

The basic principle of generalization is to assume observed, particular uniformities to be applicable generally, until and unless we have reason to think otherwise. A particular proposition arrived at by deductive means can also of course be used as a basis for generalization. The reliability of a generalization is variable, depending on certain factors.

Observation is itself not always a simple process of perception. It may involve research or experiment with certain prior assumptions, methodological or factual, which may require review and testing. The validity of the final generalization depends on the reliability of such prior factors. As well, if a research or experiment process is easily duplicated by other people, socially accessible, it is granted more credence, than a one-time, esoteric observation. Even so, ad hominem arguments count in this domain; a person of known honesty and intelligence may be allowed considerable leeway, in comparison to a habitual liar or scatterbrain.

The degree of effort and ingenuity involved in making the observations in question, also affects the reliability of the generalization. If we observe a limited number of instances and then generalize, and thereafter make no effort to, periodically or in new situations, check our result, it is less reliable obviously than if we remain open-minded, vigilant, and actively research possible deviations from our initial assumption.

The generalization should be reviewed whenever the surrounding context of knowledge has been modified in any way which might conceivably affect it. Comparison of the assumed generality to new information as it comes up, serves not only to verify it but to further confirm it if it stands the test. Here, deductive logic plays its crucial role, guiding us in verifying consistency, by opposition or uncovering implications, helping us to interconnect all our knowledge.

The more alike in nature, the simpler, the phenomena in question are known to be, the more credible and trustworthy our generalization. A generalization concerning, say, gold nuggets, is more reliable than one concerning living cells, because the instances of the former differ in little more than time and space, whereas instances of the latter, though exhibiting some

considerable uniformities, are more often found to have individual differences.

The following might be presented as the valid moods of generalization from particular propositions, whether obtained by induction or deduction, to illustrate its basic method.

(The symbols **A, E, I, O** refer respectively to propositions of the forms: All S are P, No S is P, Some S are P, and Some S are not P, where S and P are any two terms.)

I → A

Knowing that some S are P,
and not having found any S which are not P,
we may induce that ‘All S are P’.

O → E

Knowing that some S are not P,
and not having found any S which are P,
we may induce that ‘No S is P’.

I + O, knowing some S to be P and some not to be P, inhibits generalization.

Lastly, not having found any S which are P or any S which are not P, strictly leaves us with nothing to say.

However, in practice, if research was made, we might tentatively induce that ‘No S are P’ or ‘All S are P’, preferring the **E** conclusion if P is in content a positive quality, or the **A** conclusion if P is in content a negative quality. A distinction is here made between presence and absence of something, which cannot be expressed in formal terms, but is comprehensible. Such generalization concerns, not so much the subject-matter of our propositions, but the process of observation itself.

4. Particularization

The reverse process of particularization, is also noteworthy. We start with a general proposition, obtained by generalization or deduction, and a new observation which contradicts it; granting that the latter and its sources more credible than the former, we scale it down for consistency. Thus:

A + O → IO
Having supposed that all S are P,
but finding some S not to be P,
we conclude that 'only some S are P'.

E + I → IO
Having supposed that no S are P,
but finding some S to be P,
we conclude that 'only some S are not P'.

In practice, faced with such a situation, we might try to mitigate the result, by reformulating the original general thesis, so that we retain a generality. In the above, this would mean altering the subject, by delineating exceptions to it or substituting a narrower subcategory of it, and/or altering the predicate, by widening it (in positive cases) or narrowing it (in negative cases). Thus, suppose S1 and S2 are subspecies of S, and suppose P' is a genus embracing P among others, and that P1 and P2 are subspecies of P, then:

In **A + O → IO**, we may review the initial All S are P, to:

- All S1 are P (and No S2 is P), or to:
- All S are P' (though only some S are P).

Here, we narrow the subject or widen the predicate.

In **E + I → IO**: we may review the initial No S is P, to:

- No S1 is P (and All S2 are P), or to:
- No S is P1 (though some S are P2).

Here, we narrow the subject or narrow the predicate.

A pitfall in generalization is selection of too broad a subject-concept, or too wide or narrow a predicate-concept, when formulating the initial observation.

When particular entities are observed as having a certain property, the question arises are they so *qua* being of some species classification (like crocus, say), or *qua* belonging to some genus (like flowers, say). If we are tempted at the outset to adopt the genus as our subject, we may soon be disappointed, and have to later retract, and particularize the property down to the species, as above. Alternatively, we may be cautious, and adopt the species as subject, and later, finding the wider statement true, would generalize as follows:

> All S1 and all S2 are P,
>
> S1 and S2 are all the species of S,
>
> therefore, All S are P.
>
> Here, we broaden the subject.

Likewise, we may initially select a too limited predicate (e.g. blue) or a too vague one (e.g. colored), and later be obliged to qualify our assumption, as shown above.

Either way, in the long run, the correct subject and predicate should impose themselves, assuming the pursuit of knowledge is continued. So, the process is not in itself flawed, but induction proceeds by gradual evolution.

5. Validation

It should be obvious that the above 'inductive arguments', and those presented further on, involve a premises-conclusion

relationship, of a logical modality other than that found in ‘deductive argument’. Here, we are concerned with inductive implication, which boasts a connection only of logical probability; it is less binding than the logical necessity which characterizes deductive implication.

The validity of man’s inductions, his observations and generalizations, as such, cannot be consistently denied. One can deny this or that specific case to be justified, by adducing evidence to the contrary, but the processes themselves cannot be in principle doubted. For the simple reason that, in so doing, the skeptic is himself formulating a general statement, and so bringing about its own demise. A self-contradictory statement simply has no logical standing. It is automatically and irretrievably false. There are no loop-holes in this reasoning.

The fact that knowledge is contextual, does not imply that it is entirely problematic. The appearances involved in observation and generalization must be taken at their face value, and recognized as indubitably valid, until and unless some specific cause for doubt is brought to the fore, which itself stands the tests of inductive and deductive logic. If that doubt turns out to be indeed justified, the initial observation or generalization is admitted, *ex-post-facto*, to have been mistaken, and modified or abandoned to restore consistency.

Our ignorance of a great variety of epistemological and ontological descriptive facts, such as the nature of consciousness, the workings of our sensory perception or conceptualization, the nature of universals, and all related issues, in no way constitutes a credible reason for doubt. We are well protected by the axioms of logic. We may be humbly aware of our limitations, know with certainty that some of the beliefs we even now may cherish most are bound to turn out to be spurious as the adventure of knowledge progresses, but we may rest assured that not all will be overturned. It is logically impossible, inconceivable to suppose otherwise.

Man does not need to be omniscient to know. Our faculties are effective instruments of knowledge. Knowledge is a continuously evolving, flexible entity. Like a living organism, it changes and shifts, but somehow endures. We have not been

endowed with a finished product, but we have been blessed with the means to gradually progress towards that distant goal. Knowledge is essentially functional, a biological tool of survival; as the need for information presents itself, so normally does the opportunity for its procurement. Knowledge is also a spiritual value, one to be attained by effort.

The important thing is to tailor one's judgements to fit the facts. So long as one's assumptions and beliefs are up to date, and continuously updated by new data as it appears, they remain reliable and useful.

To trust in one's judgements does not abrogate one's right to investigate alternatives and implications; indeed, it is responsible behavior. Certainty and open-mindedness, certainty and verification, are quite compatible. However, there is also a limit to how much one may toy with new ideas, without good reason and rigorous thought.

More broadly, we can say that cognition, like volition, has an ethic, including virtues and vices. Among the virtues are: reasonableness, honesty, making an effort, facing facts, courage, willingness to debate an idea one considers outrageous. Among the vices are: irrationalism, dishonesty, lethargy, evasion, fear of opposition or change, autism. This topic borders on psychology, and could be the subject of a whole treatise by itself.

10. MODAL INDUCTION

Drawn from Future Logic (1990), Chapter 54.

1. Knowability

Some skeptical philosophers have attempted to write-off natural necessity, and potentiality, as unknowable, if not meaningless. We have shown the meaningfulness and importance of these concepts, in the preceding pages. Here, we will begin to show systematically how they may be induced.

At the outset, let us note that to assert that natural necessity cannot be known, is to claim knowledge of a naturally necessary phenomenon; this is implicit in the use of 'cannot' in such assertion. If the assertion were merely put as 'man does not know natural necessity', in an attempt to be consistent, we see that the statement would have no force; we could still ask 'but can he?' Thus, this concept is undeniable, and its attempted rejection untenable.

Furthermore, the formal link between natural necessity and potentiality, makes the latter also inevitable. They are two sides of the same coin, if either is admitted then the other logically follows by systematization: every concept must have a contradictory. The potentiality of something is merely negation of the natural necessity of its absence. Thus, the intrinsically concealed and invisible aspect of unactualized potentiality, is not an valid argument against its existence.

The induction of natural modality, and for that matter the more readily recognized temporal modality, follows the same patterns as those involved in the process of induction of extensional modality.

How are universal propositions induced? By a process of generalization, moderated by particularization. We consider it legitimate to move from empirically encountered instances to cases we have not yet come across, until the facts suggest otherwise. We do not regard our universal statements to cover

no more than the perceived phenomena; but normally move beyond them into prediction.

Likewise, with constancy of conjunction, in the sense of temporal modality; this too involves an extrapolation from the known to the unknown, as everyone admits.

So, ‘all’ and ‘always’ involve just as much assumption as ‘necessarily’ (in the sense of natural modality). They are all just as hard to establish. Why should we recognize the former and not the latter?

Further, the concepts of universality and constancy are ultimately just as mysterious, ontologically hard to define, as that of natural necessity, so the latter’s elusiveness cannot be a legitimate reason for singling it out.

If natural necessity is understood as one level higher (or deeper) than constancy, subject to all the usual laws of logic, generalization and particularization, it is seen to be equally empirical and pragmatic.

While the denial of natural necessity as such is unjustified, with regard to specific applications of the concept, we may of course in a given instance be wrong in our assumption that it is there. It is up to Logic to teach us proper procedures of induction and deduction, concerning such relationships. There is no problem in this viewpoint; belief in natural necessity as such does not obligate us to accept every eventual appearance of it as final.

As with any generalization, the movement from always to must, or from never to cannot, is legitimate, so long as it remains confirmed by experience. If ever a contradictory instance occurs, obviously our assumption is put in doubt and we correct our data-base accordingly, in the way of particularization.

2. Equality of Status

We saw, in the chapter on induction of actuals, that induced particulars are based on the observation of singulars. Similarly, induction of temporaries or potentials is based on the observation of actuals. The same can be said of the bipolar particular fractions, which involve temporary or potential

elements: they can be established by observation of the same instance of the subject being actually related to the predicate in different ways at different times or in different circumstances.

And just as not all particular actuals are induced, but some are arrived at by deductive means, so also temporary or potential knowledge is in practice not invariably inductive, but may derive from reasoning processes. Though ultimately, of course, some empirical basis is needed, in any case.

We additionally pointed out how, in the formation of particular propositions, there is also a large share of conceptual work. The same is true of other types of possibility. All statements involve concepts (the terms, the copula, the polarity, the qualifications of quantity or modality). They presuppose a mass of tacit understandings, relating to logical structure and mechanisms. Furthermore, there is always an evaluation process, placing the proposal in the broad context of current knowledge, to determine its fit and realism.

Thus, although pure observation is instrumental in the process, other mental efforts are involved. Abstraction and verbalization of possibility are not automatic consequences of awareness of singular actual events, and error is always a risk. This is equally true in all types of modality, whether extensional, temporal or natural. Thus, actual particulars cannot be claimed more plausible than temporaries or potentials.

And indeed, just as particularity is not superior in status to generality, so are the other types of possibility not intrinsically more credible than their corresponding necessaries. If we consider the controversies among philosophers to be resolved, and view the whole of Logic in perspective, we can say that all forms involve only some degree of observation, and a great deal of thought. Although the degree of empiricism admittedly varies, the amount of conceptualization is essentially identical.

This insight must not be construed to put knowledge in general in doubt, however. Such skepticism would be self-contradictory, being itself the pronouncement of a principle. That there is a process does not imply that its outcome is false. The process merely transports the data from its source to its destination, as it were; the data need not be affected on the way.

Rather, its significance is to put all forms on an equal plane, with regard to their initial logical value. Particulars are no better than universals; particulars are no better than temporaries, which in turn are no better than potentials; and the latter are no better than constants or natural necessaries. Every statement, whatever its form, has at the outset an equal chance of being true or false, and has to be judged as carefully.

3. Stages of Induction

The classical theory of induction, we saw, describes two processes, generalization and particularization, as fundamental. If all we know is a particular proposition, **I** or **O**, we may assume the corresponding general proposition, **A** or **E**, true; unless or until we are forced by contradictory evidence to retract, and acknowledge the contingency **IO**.

Now, this description of the inductive process is adequate, when dealing with the closed system of actual propositions, because of the small number of forms it involves. In a broader context, when modal propositions of one or both types are taken into consideration, the need arises for a more refined description of the process.

This more complex theory brings out into the open, stages in or aspects of the process which were previously concealed. The ideas of generalization and particularization were basically correct, but their application under the more complicated conditions found in modal logic require further clarifications, which make reference to factorial analysis.

Needless to say, the new theory should be, and is, consistent in all its results with the old theory. It should be, and is, capable of embracing actual induction as a special case within a broader perspective which similarly guides, validates, and explains modal induction.

Our modified theory of induction, in the broadest sense, recognizes the following stages:

a. ***Preparation***. The summary of current data in gross formulas, and their factorization. This is in itself a purely deductive process.

b. ***Generalization***. Selection of the strongest factor in a factorial formula.
c. Drawing consequences, empirical testing, and comparing results to wider context. These include deductive work and observation.
d. ***Particularization***. Revision of current formulas in the light of new data. This may necessitate weighting of information. Also, certain conflicts are resolved by factor selection, as in generalization.
e. Repeat previous steps as required.

Each of these processes requires detailed examination. The tasks of listing all conceivable gross formulas, and analyzing them factorially, as well as the tasks relating to deductive inference and comparison, have previously been dealt with. We now need to deal with the processes of factor selection and formula revision, which are the most characteristically inductive.

4. Generalization *vs*. Particularization

We call generalization, those thought processes whose conclusions are higher than their premises; and we call particularization, those whose conclusions are lower. This refers to expansions and contractions on the scales of quantity and modality, essentially. As we move beyond the given, or its strictly deductive implications, into prediction, we are involved in induction of one kind or another.

The problem of generalization, which way and how far to advance and on what basis, is solved entirely by the method of factor selection. The problem of particularization, which way and how far to retreat and on what basis, is solved by the methods of formula revision, which may involve factor selection.

It will be seen that factor selection has a static component, which consists of the uniformity principle, which tells us which factor to select, and an active component, the practical carrying out of that decision. The act and basis of factor selection is technically

identical, whether applied to generalization or to particularization.

The theory of factor selection makes clear that these processes do not consist of wild guesses, but proceed in a structured manner, requiring skill and precision.

We may view generalization as the positive force in induction, and particularization as the negative side. Generalization would often be too sweeping, if not kept in check by particularization. The function of the latter is to control the excesses of the former. Only the interplay of these two vectors results in proper induction. Induction is valid to the extent that it is a holistic application of both factor selection and formula revision.

In the pursuit of knowledge, laziness leads to error. An idea must be analyzed to the full, because its faults are sometimes concealed far down that course. The uncovering of a fault is a boon, allowing us to alter our idea, or take up a new one, and gain increased understanding and confidence.

The processes of generalization and particularization are going on in tandem all the time, in an active mind. Induction is not linear or pedestrian. Thoughts extend out tentatively, momentarily, like trial balloons, products of the imagination. But at the same time, verification is going on, unraveling the consequences of a suggestion, bringing other facts into focus from memory, or making new empirical inquiries, for comparison to the proposals made, and construction of a consistent idea. The wider the context brought into play, the greater the certainty that our course is realistic.

The role of Logic as a science is to provide the tools, which enable us to play this mental game with maximum efficiency and success. It is an art, but training and experience improve our performance of it.

5. The Paradigm of Induction

Let us reconsider the paradigm of induction given by actual induction. By reviewing the closed system of actual propositions using factorial concepts, we can gain some insights into the stages and guiding assumptions of induction within any system.

There are only four plural actual forms: **A**, **E**, **I**, **O**. These are also the system's *fractions*: (**A**), (**E**), (**I**), and (**O**). These in turn constitute three *integers*: (**A**), (**E**), and (**I**)(**O**), which are mutually exclusive and exhaustive. The 4 forms allow for 5 *gross formulas*: **A**, **E**, **I**, **O**, **IO**. These can be *analyzed factorially* using the integers: **A** = (**A**), **E** = (**E**), **I** = '(**A**) or (**I**)(**O**)', **O** = '(**E**) or (**I**)(**O**)', **IO** = (**I**)(**O**). But two disjunctions of factors remain unexpressed, namely: '(**A**) or (**E**)', signifying incontingency, and '(**A**) or (**E**) or (**I**)(**O**)', signifying no concrete information.

In this framework of factorial analysis, we can understand the induction of **A** from **I**, or of **E** from **O**, as a process involving factor selection, rather than solely as one of increase in quantity from some to all. The reverse process, of decrease in quantity, would also here be regarded differently, as primarily focusing on a new factorial situation.

Given **I** alone, we prefer the alternative outcome (**A**) to the deductively equally conceivable alternative (**I**)(**O**). Or, given **O** alone, we inductively anticipate the factor (**E**) as more likely than its alternative (**I**)(**O**). Our selection of one factor out of the available two is the dynamic aspect of the process. That we have specifically preferred the general alternative to the contingent one, is a second aspect; here, we take note of a principle that statically determines which of the alternative factors is selected.

If thereafter we find that our position must shift to **IO**, so well and good; in that case, only one integer is conceivable: (**I**)(**O**). In this case, we believed **A** to be true, then discovered **O**, or we assumed **E** then found **I**: the only available resolution of this conflict is by the compromise compound proposition **IO**; this is formula revision per se. Now, we analyze **IO** and find that it has only one factor (**I**)(**O**), so we can select it without doubt. However, had there been more than one conflict resolution or more than one factor (as occurs in wider systems), we would have had to again engage in factor selection.

Such an outlook seems somewhat forced and redundant within the closed system of actuals, but in the wider systems of modal propositions it becomes essential. It is only applied to actuals here for initial illustration purposes. For whereas with actuals,

our choices are very limited numerically, when modality is introduced they are much more complicated, as will be seen.

(The suffixes **n** and **p** applied to the symbols **A, E, I, O** refer respectively to necessity and possibility. Thus, for instance, **An** signifies ‘All S must be P’, while **Ap** signifies ‘All S can be P’.)

In the wider systems, induction can usually take many paths, and has various possible limits. For instance, from **Ip** should we generalize in the direction of **Ap** or to **In**? Or again, from **An** should we particularize to **Ap** or to **In**? And how far up or down the scale may we go? Obviously, this depends on context, so when may **Ip** ascend to **An**, and when must it stop earlier, and when must **An** descend to **Ip**, and when may it stop earlier?

Such questions can only be answered scientifically and systematically by resorting to factorial analysis and related processes. This brief review of actual induction in such terms points the way to the solution of the problem.

6. The Pursuit of Integers

The factor selection theory suggests that the goal of induction is to diminish the areas of doubt involved in deficient states of knowledge. Selecting a factor means eliminating a number of other factors, which, though they are formally logically conceivable alternatives, are intuitively thought to be less likely.

The ultimate result pursued by all induction is knowledge of integers, which does not necessarily mean a generality. Without integers, too many questions arise, and the mind cannot proceed. It is better to take up a working hypothesis, and keep testing it, than to passively wait for an in any case unattainable absolute certainty. Knowledge is fed by action; it involves choices, decision-making.

The whole point of induction is to decide what integral proposition is most suggested by a given statement of deficient knowledge. We are to scrutinize its factorial equivalent and, on the basis of precise principle, select one factor as our inductive conclusion, or at least reduce the number of factors considerably. Deductively, all factors are equally likely outcomes, but inductively they can be narrowed down.

In certain cases, as factorial analysis showed, there is only one factor anyway; in such case, the conclusion is deductive, not inductive, and contextually certain. But in most cases, there are more than one factor, and selection is necessary. In some cases, we may for some purpose be satisfied with eliminating only some of the excess factors, and be left with a formula of two or more factors; the conclusion is not a single integer, but, still, less vague than previously, and might be expressed as a gross formula.

11. Factor Selection

Drawn from Future Logic (1990), Chapter 55.

1. Prediction

We indicated in the previous chapter that induction depends on factorial analysis of our knowledge context. Once this is done, we are usually faced with a number of factors to choose from, which represent the various outcomes our knowledge may move towards.

But reality can only exist in terms of integers; it is only the deficiencies of knowledge which make possible the indefinite situation of integers in disjunction. On this basis, we know for sure that one, and only one, of the factors of a formula can be factually correct. The other alternatives, if any, are a sign of doubt; they do not represent a fact of reality.

There is no recognition of an 'Uncertainty Principle' in this logic. Uncertainty is a phenomenon of consciousness, with no equivalent in the Object. It is perhaps conceivable that certain motions of matter occur indeterministically, without order or cause, as modern Physics suggests. But, according to Logic, whatever has occurred, once it has occurred, is firmly fixed, be it discernible or not.

The inductive process of factor selection consists in anticipating reality, trying to predict, from the available knowledge of contextually allowed factors, which of the factors is most likely to emerge as the right one. In some cases, while such a definite result is inaccessible, we try to at least approach it, by diminishing the number of factors. In other cases, the given formula has only one factor, anyway, so there is no problem, and the result is deductive.

The question arises, how do we know which factor is most likely? Formally speaking, they are all equally possible; this is the verdict of deductive logic. But induction has less strict standards of judgment.

2. The Uniformity Principle

The principle involved in factor selection may be glimpsed in the paradigm of generalization from actual particulars. We will call it the uniformity principle, understanding by this term a broad, loose reference to repetitiveness of appearances, coherence, continuity, symmetry, simplicity.

Consider for example generalization from **I**. The general alternative (**A**) is more likely then the contingent one (**I**)(**O**), ***because the former involves no unjustified presumption of variety in polarity like the latter***. We are not so much inventing information, as refraining from baseless innovation and maintaining continuity.

Thus, the qualitative inertia of the first factor is more significant than the quantitative change (from some to all) it introduces. In contrast, the second factor introduces just as much quantitative change (through the **O**), so that it is no better in that respect; and additionally, to its detriment, a novel fragmentation of the extension, absent in the original data and the preferred factor.

We obviously select the factor most resembling the given data, as its most likely outcome. Unless or until we have reason to believe otherwise, we assume the given information to be reproduced as far as it will go. We can thus express the principle that, in factor selection, the most uniform factor is to be accorded priority.

Ontologically, this signifies the assumption of maximum uniformity in the world, in preference to an expectation of diversity. Events are believed representative, rather than unique. The world seems to tend in the direction of economy.

On a pragmatic level, the reason for it is that a generality is easier to test than a particular statement, since deductive logic, through which the consequences of assumptions are inferred, requires general statements. Thus, the preference for uniformity also has an epistemological basis. In the long run, it assures us of consistency.

The uniformity principle, then, is a philosophical insight and posture, which sets an order of priority among the factors of a formula.

But, it is important to stress that this principle is merely a utilitarian guideline to factor selection, it does not in this format have the binding force or precision found in the laws of deductive logic. Inductive logic merely tries to foresee the different situations which may arise in the pursuit of knowledge, and to suggest seemingly reasonable decisions one might make.

Choices other than those proposed remain conceivable, and might be intuitively preferred in specific cases. There is an artistic side to induction, to be sure. Our general recommendations, however, have the advantage of having been thought out in an ivory tower, and of forming a systematic whole.

3. The Law of Generalization

Fortunately, we can neatly summarize the results, obtained by application of the uniformity principle, in a single, precise law for generalization. This has greater practical value.

The reader will recall that when the integers were defined, they were organized, in order of the number of their fractions. Those with the least fractions came first, then those with two fractions, then those with three, and so on. Within each such group, comparable integers of opposite polarity were paired off, with the more positive one preceding the more negative. Also, they were ordered according to their level of modality in the continuum concerned.

Thus, in the closed systems of natural or temporal modality, the 15 integers **F1-F15**, and in the open system of mixed modality, the 63 integers **F1-F63**, are ordered in such a way that their numbers reflect their degree of 'strength'. The lower the ordinal number, the stronger the factor.

A stronger factor is less fragmented (i.e. has less fractions, out of a possible 4 in the closed systems, and 6 in the open). It is closer to universal (in the closed systems, **F1-F4** are universal;

in the open system, **F1-F6**). It has higher modality; for instances, (**An**) is higher than (**AEp**), (**In**)(**On**) is higher than (**IOp**)(**IpO**).

Thus, in any factorial formula, the factors in the series are already numerically ordered according to their relative strengths. This was not done with factor selection in mind, but because of the clarity it generated in the doctrine of factorial analysis. As detailed work will presently reveal, it turns out that:

> ***In any factor selection, the strongest factor is the one to prefer.***
>
> This is the law of generalization.

In a few exceptional cases, the first two factors must be selected, in disjunction, for reasons that we shall see. But, on the whole, this law holds firm, and successfully sums up all our findings.

This law is a summary of results. In point of fact, it only emerged at the end of painstaking analysis of a large number of specific inductive arguments, attempting to make sense of them, case by case, through the intuited uniformity principle. However, once arrived at, it seems obvious. But the true justification of it all, is the consistency and cogency of the totality of the theory, with all its details, of course.

Note well, incidentally, that henceforth, to avoid neologisms, the term 'generalization' is used in a general sense not limited to quantity. It is applied to either increase in quantity, from some to all; this is extensional generalization. And/or to increase in modality from possibility to actuality to necessity; this being modality generalization, (natural and/or temporal, as the case may be). Likewise, the term 'particularization' may be used for any such type of decrease.

But most precisely, generalization may now be defined as inductive selection of the strongest factor(s) of a formula, by suppression of weaker factor(s). Particularization will be dealt with under the heading of formula revision.

Generalization can, therefore, be applied to deficient states of knowledge not expressible in gross formulas. We saw in the chapter on factorial analysis that, while all disjunctions of

integers represent deficient states of knowledge, some of them do not correspond to any gross formula. In other words, gross formulas with two or more factors are not all the possible states of relative ignorance, other combinations of factors are conceivable.

The law of generalization makes selection of the strongest factor legitimate in such already factorial formulas, too.

12. FORMULA REVISION

Drawn from Future Logic (1990), Chapter 57.

1. Context Changes

As knowledge evolves, our position shifts from one set of givens to another, and the inductive or deductive conclusion concerning any subject to predicate relation must be adapted to the new situation. All knowledge is contextual and tentative, anyway, in principle. Changes in context are to be taken in stride, as normal and to be expected. The current formula is revised, reformulating our state of knowledge in the light of new input, and then induction and deduction proceed as usual.

There are two kinds of context change. Starting with some formula, we discover new data, concerning the same subject to predicate relation. The new input may either be compatible with the preceding context, and be implicit in it and so without effect on it, or add to it, making it more specific. Or the new input may be incompatible with previous positions, in which case some conflict resolution is required.

We may discover such factual or logical errors in our beliefs by deductive or inductive means, from whatever sources.

Some new line of thought or generalization or observation may have taken place, which shows our preceding belief to be too limited or too vague or over-extended. Or the novelty involved may be relative: we may have come across this additional data before the data under consideration, but simply did not instantly make the conceptual connection; here, the novelty lies in our only now becoming aware of its impact.

The old and new information may have the same or different form: each may be positive, negative or bipolar; it may be particular, singular or general; it may have any modality; it may be elementary or compound; it may be a fraction, an integer, or even already in factorial form.

Whatever the case, formula revision is needed. We must step back and reconsider our situation in the light of the new data, formulating a new gross statement of our position to fit it, and drawing a new inductive conclusion from that.

Nevertheless, we want to retreat from previous positions as conservatively as possible. We do not want to radically revise our ideas or beliefs every time we face new material, though in some cases we may have to do just that. We do not want to overreact and lose valuable information, unless we have to. So, we must learn to evaluate the seriousness of our predicament, and develop techniques for handling the various kinds of problems.

Formula revision, like factor selection, is largely an art, rather than an exact science. In some cases, the result is clear-cut; but in many situations, we are faced with a variety of paths which may seem equally credible, and the choice among them is intuitive and esthetic to a great degree. The task of logical theory is to facilitate decision making in such cases, by clarifying the options and their significances. It provides the artist with the tools, without rigidly prescribing their use.

2. Kinds of Revision

We may distinguish two kinds of formula revision: amplification and harmonization.

Amplification occurs when the additional information is consistent with the original givens, and so can be simply conjoined to them. Note the connotation of growth. (Perhaps the name ‘apposition’ would have been more appropriate, but I settled on the latter because of its musical analogies.)

Amplification is of two kinds. It may narrow down the potential scope of a proposition; we call this process ‘specification’. Or it may broaden the actual scope of a proposition; we may call this ‘elaboration’. For example, given first that some S are P — if we thereafter find that some other S are not P, the initial proposition is further specified, whereas if we find that all other S are P, it is broadened. The logical possibility of the particular proposition

to become general, is stifled in specification, but confirmed in elaboration.

Harmonization occurs when merging the two formulas would yield an inconsistent conjunction, so that some decision or compromise between them must be sought. We often call this process ‘reconciliation’.

Amplification may occur between propositions of similar or different polarity, provided they are not contrary or contradictory. Harmonization, in contrast, always concerns propositions of somehow opposite polarity, which are wholly or partly in conflict.

The premises and conclusions of these operations may be of similar strength, or weaker, or stronger, depending on our point of view.

Amplification of a formula is straightforward enough, formally speaking. Still, having assumed the original formula complete, in the sense of summarizing available knowledge, we may have made a generalization, and then deductions from this, which must now be reconsidered: they are now open to doubt, though not deserving of outright rejection. For the new, amplified formula will very likely suggest other inferences. Such review of the wider context is very often difficult; sometimes it is impossible to retrace our past course, and we must hope that inconsistencies will eventually arise, allowing us to streamline our knowledge base.

With regard to harmonization, or conflict resolution, one or both of the clashing, or adverse, theses must be changed to remove the problem and harmonize our knowledge. If one or the other is dominant, because of the greater credibility of its foundations, the other will be downgraded alone, or even totally eliminated if required; the latter may then be said to have conceded or yielded to the former. If they are of equal weight, for lack of a reason to prefer the one over the other, the common ground between them is sought: they in principle have to both be downgraded (though in certain cases it is permissible and sufficient to downgrade only one). Whatever the conflict, questions arise as to how deep a correction is called for, and in what direction it should be

effected. Obviously, the retreat in quantity and/or modality should be the minimal permissible.

Here again, the consequences on the wider context of knowledge must be considered, to the extent possible, and these may in turn boomerang on the propositions under consideration, through successive formula revisions.

If a premise was itself obtained by deduction, and has been denied or downgraded for the purposes of conflict resolution, those prior sources are now known to certainly contain some error, and some or all of them must in turn be revised. Also, if either or both of the two original theses were generalized, before our becoming aware of their conflict, we can expect the inductive conclusion from their harmonization to disagree with one or both of these anterior inductions. If any deductions were made from a premise or its generalization, they are now put in some doubt, even if not automatically to be rejected.

Formula revision always means the conjunction of an old and new thesis. They may both be gross formulas (elementary or compound), or both be fractional formulas (isolated fractions or seeming to make up an integer). Or we may be dealing with the interactions between these various kinds of formula. Even deficient formulas not expressible as gross formulas may be involved. We have to look into all the possibilities.

All these issues will become clearer as we proceed with applications.

While the pursuit of consistency is recognized as in the logical domain by tradition, it has been dealt with in relatively vague terms. Effectively, we were given the tables of opposition as tools, but no step by step tactical instruction. We were told that in the event of inconsistency we should review our assumptions, but we were not provided with more specific guidance. The reason for this is that the classical model, where categorical propositions are all actual, is too limited and simplistic. The modal system provides us with a larger field of activity, complex enough to suggest the kind of difficulties which occur in practice.

3. Particularization

Formula revision involves two initial theses, to be somehow fused in the conclusion. Formula revision occurs because of time lags between the emergence of items of knowledge, which may be consistent or inconsistent. But at the moment of revision, the time ingredient becomes irrelevant, and the theses are logically at the same level. One may not be regarded as more of a premise than the other.

Since formula revision involves two theses as premises, our understanding of each operation depends on which premise we compare to the conclusion. Looking at the one, we will notice this or that change has been effected on it by the process; looking at the other, the process has a different character. Both must be looked at, rather than subjectively focusing on either as 'the premise', to avoid misinterpreting the process.

Also, we may be tempted to compare the possible generalizations from the premises to the anticipated generalization from the conclusion. Or the one as-is to the generalization of the other. Inquiry of this sort is not without value, but should be done consciously, without confusion as to what precisely are the starting points and end result of the formula revision per se.

We should view formula revision as only including the work of amplification or harmonization as such. The generalizations which might have been made from the premises, or the generalization which normally follows the conclusion, are in principle optional and independent operations. Although, as we shall see, these may play a central role in the direction the formula revision takes.

Now, we would characterize as 'particularization' any process whose result is weaker than (or at best equal in strength to) the givens. This refers to decreases quantity and/or modality, essentially. Such contraction can be expressed as an increase in the number of weak factors, or as disappearance of stronger factors.

While formula revision does indeed usually involve particularization of the elements involved, there are certain

special cases where it in fact yields a stronger conclusion. Sometimes there is a particularizing effect in one respect and a generalizing effect in another. The term ‘formula revision’ therefore has a more neutral connotation than the term ‘particularization’, and they may not always be equated, though they are often loosely-speaking confused.

Amplification of gross formulas is purely deductive revision, and only the subsequent generalization from its conclusions may be called inductive. But amplification of fractional formulas is itself inductive, quite apart from any subsequent generalization.

Harmonization, on the other hand, is only deductive in its application of the laws of opposition; with regard to its evaluations of credibilities, and its choices between alternative conflict resolutions, it is inductive, as much so as subsequent generalizations from its results.

We saw that generalization starts from a consistent body of knowledge, which, viewed simultaneously, has been summarized and factorized; thereafter, the strongest factor among those available is selected, so that the conclusion is generally superior to the premise.

Formula revision does not exactly refer to a mirror image of this process. It has a different structure and goal, the marriage of two premises. Particularization is not its essential goal, and not always its result. Furthermore, as we shall see, formula revision often solves problems by factor selection under the law of generalization.

Particularization is not a distinct process, but refers to certain specific applications of processes already defined. Consequently, it has no clear-cut ‘law’ or ‘rules’ analogous to those for generalization. We cannot simply convert the latter to predict the former. For instance, we cannot say that, since the latter prescribes that we favor quantity over modality, the former will affect modality before quantity. As will be seen, in some cases the result is one way, in other cases, the other way.

13. PHENOMENA

Drawn from Future Logic (1990), Chapter 60.

This chapter confronts certain ontological issues.

1. Empirical or Hypothetical

A basic principle of science is that ***we may rely on empirical evidence, and indeed that all our hypotheses must ultimately be grounded in experience***. This means that we attach special credibility to the empirical, from which the credibility of the hypothetical is to be derived. The former is raw data, the latter involves processing of data.

This is all well and nice, but just what do we mean by ‘the empirical’, and how do we distinguish it from ‘the hypothetical’? The question is exceedingly difficult to answer with precision, as we shall see. For example, I may look out of my window, and see rain, but then discover that all I saw was a shower of water from the roof. The ‘rain’ seemed empirical enough at first, but then had to be declassified as a failed hypothesis.

In a large sense, anything appearing before us is ‘empirical’ — it is in itself given, whether we interpret it correctly or not; in this sense, even the ‘hypothetical’ is empirical, and it is so even if misleading. In a narrower sense, not all appearances count as ‘empirical’; those we label ‘hypothetical’ are either excluded from this heading, or only included under certain inductive conditions.

In any case, we cannot refer to the concepts of ‘reality’ and ‘illusion’ for the distinction, except after the fact. If we try to refer to divisions we commonly make, like the physical versus the mental, or the concrete versus the abstract, we still encounter difficulty. Still, these dichotomies play a role of sorts, so we should explore them in more detail.

We shall see that, ultimately, all phenomena are *in themselves* empirical; the characterization of certain phenomena as hypothetical only arises insofar as they are taken as *representing* something other than themselves.

2. Physical or Mental

It is very difficult to define the difference between physical (or material) and mental (or imaginary) phenomena.

a. Most evident to us are what we call *'physical or material'* phenomena. This at the outset includes the experience of sights, sounds, feelings, smells, and tastes, of various kinds and intensity (for example, sights vary in shape, color and intensity of light).

However, some of the sights, sounds, feelings, smells, and tastes we commonly experience, those in thinking or dreaming, for instances, somehow do not seem physical to us; so we call these *'mental or imaginary'* phenomena, to differentiate them.

Thus, the various phenomena we primarily associate with the physical domain, are on second thought found not to be exclusive to that world, but also found in the mental domain. This means that we must refer to some other or additional factor(s), to define what we intend by the words 'physical' or 'mental'.

b. In the field of physical phenomena, each of us experiences a group of phenomena as being peculiarly close to self: we call this our personal body.

Briefly put, within this body, we distinguish various organs, to which we assign different functions. Some of these organs, which we call the sense-organs, seem especially related to the above-mentioned physical qualities: the eyes to experience of sights, the ears to experience of sounds, and so forth; further scrutiny by biologists has shown us more precisely how each of these operates.

Our position at that stage is that phenomena like sights and sounds are physical if (seemingly) experienced 'through' the sense-organs, and otherwise they are mental. The body and

sense-organs are themselves physical, being visible with our own eyes, audible to our own ears, and so forth.

c. Incidentally, we may now take note of another group of phenomena: the bodily pleasures and pains of different sorts, which we commonly experience.

These phenomena are not sights, sounds, smells, tastes, nor quite like other touch-feelings. Yet they seem to take place inside our personal body, in the head, heart, digestive tract, sex organs, members, and indeed further study by biologists has uncovered relevant sense-organs within the body.

Later, we consider that some of these bodily phenomena have physical causes, some mental causes. But their common location in the body establishes them as in themselves physical (specifically, physiological) phenomena, and we are led to expand the definition accordingly.

It is not clear to me whether the bodily pleasures and pains experienced during dreams, say, are occurring within the dream itself (i.e. are themselves dreamed), or are merely triggered in the physical body in conjunction with the dream. For this reason, I am not sure whether these feelings have mental equivalents, as the other physical phenomena do.

Note that modern biology, according to Curtis and Barnes (440-466), groups the sensory receptors as follows:

> "Like most animals we have mechanoreceptors (touch, hearing, position), chemoreceptors (taste and smell), photoreceptors (vision), temperature receptors, and receptors for the sensation we recognize as pain. We do not have electroreceptors or magnetoreceptors, but some animals do" (458).

I do not know why pleasure is not mentioned here, incidentally[3]. In any case, the similarities of operation among some receptors

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3 Furthermore, I wonder if we are truly unable to perceive electromagnetic waves. I have rather often had the following experience: I spontaneously 'hear' a musical piece or song 'inside my

does not imply that the sense-modalities, the phenomena apprehended by the perceiver, are qualitatively the same, note well.

d. We are tempted to define the physical domain with reference to space and time. The body and what lies beyond it seem extended in a continuum. However, this presents a difficulty, in that mental phenomena like thoughts and dreams are obviously also extended — certainly in time, and in a mental parallel of space, if not physical space.

With regard to time, we can say that physical phenomena are on the whole more persistent, and mental phenomena on the whole more ephemeral. However, this distinction is more statistical, than applicable to individual phenomena. Many physical phenomena are fleeting, and even those that are assumed permanent are not constantly experienced by us.

With regard to space, the issue is further complicated when we take into consideration various illusions:

Some physical illusions are explained with reference to physical causes other than the sense-organ through which they appeared. For example, optical illusions like the moon seeming in the lake due to reflection; we learn that the moon is not in the lake by diving in and trying to touch it. Other examples: an echo, or a lingering odor due to the continued presence of certain molecules in the nose.

Some physical illusions are explained with reference to the experienced or inferred malfunctions of the sense-organ through which they appeared. For example, if I cross my eyes and see double, or plug my ears and hear nothing. Or again, I see certain threads in front of my eyes, and assume they might be projections of scars in the lenses of my eyes.

Such physical illusions are judged unreal through alternative sense-organs, and relatively easy to explain. For instance, what I precisely see, when I seem to see the moon, say, is the light

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head', then turn on the radio, and perhaps tune it, and discover that precisely that music or song is being aired. Coincidence? Or did I somehow 'receive' the radio program directly?

from the moon; there is always an extrapolation from the sensory interface. However, we thus learn that not all physical appearances are ‘real’ — some of the things which appear in physical space cannot be taken at face value, but must be regarded in a wider context. Such phenomena are said to be *virtual*.

More difficult to understand, are *hallucinations*:

Some mental projections seem to occur ‘in the head’: as when I experience my verbal thoughts, or I close my eyes and visualize certain vague shapes or clearly remember the scene in a movie. Some mental projections are much larger and more vivid, but still seem to take place in an ‘inner space’: thus with strong dreams (we all occasionally have them), or in certain meditative experiences or prophetic visions, or under the influence of psychotropic drugs or of psychosis.

But *some mental projections seem to go right out into physical space*: through powerful memories, like a beloved face, or a frightening or disgusting animal we came across long ago; or again, in certain meditative experiences and prophetic visions, or through psychotropic drugs or psychosis.

Such phenomena, which we call hallucinations, are judged illusory by appeal to a wider context: because they are relatively intangible and fleeting, or by the verdict of one’s other sense-organs or other people’s, or with reference to their having been preceded by meditation or drug-ingestion. (There are, of course, many kinds of meditation.) However, as far as I know, they are not attributable to lingering or artificial impressions at the sense-receptors.

The fact remains that hallucinations seem to inhabit physical space although not regarded as physical phenomena. You can truthfully say of such an apparition: ‘it seems to be placed out there, to my left, between the table and the chair’ — even if it does seem unpalpable, and more transparent and transient (because these attributes are not exclusive to hallucinations). For these reasons, we cannot make a clear, spatial distinction between the physical and mental domains.

e. Another difference we might point to is that physical phenomena are public knowledge, whereas mental phenomena, however vivid, are private.

Not all the physical events which one experiences are also experienced by other people, but that kind of event is often agreed upon by two or more people.

In contrast (to my knowledge), mental phenomena are never, in that sense, shared. We can only report to others what we intimately see, hear, feel, smell or taste, and we presume others have more or less similar experiences under the same circumstances, but there is no way we know of to intimately test and confirm each other's individual mental experiences simultaneously. Scientists can detect and measure their physiological accompaniments, but to date cannot 'photograph' figments of the imagination.

However, the reference to publicity or privacy does not provide us with a clear differentia. For a start, it involves a circularity: the anterior anti-solipsistic assumption that 'other people' are not themselves chimera, but as physical and conscious as they seem, and that our languages are coherent. Secondly, physical events are not invariably public, though we assume them to be potentially so, and perspectives differ anyway. Thirdly, even if you could see my fantasies and I yours, we would still (I daresay) agree that they somehow differ from physical events.[4]

f. In conclusion, all we can say to distinguish physical and mental phenomena is that they are, assumably, in some significant respect, *'substantially' different — distinct stuffs*.

The controversy as to which of the two domains is more 'real' than the other (some cultures favor the physical, some the mental), is not relevant to defining their difference. Whether this difference is profoundly radical; or the stuff of mental phenomena is only a peculiar kind of matter; or physical events

4 An acquaintance of mine, Robert Fox, has pointed out to me, after reading the above remarks, that people seem to be able to have collective delusions, of a perceptual as well as conceptual kind; in such case, the irony is that someone without this delusion, or with a different one, would be the one judged 'deluded', because singular.

are themselves but dreams — we do not know the answer to this question, and it is seen as not immensely important to philosophy once clearly posed. We can admit of a noticeable difference, without having to be able to explain it.

The two domains have, evidently, much in common: the experienced 'qualities' of sights, sounds, feelings, smells, and tastes. But our intuition tells us that they are somehow at odds; and a difference of some sort has to be assumed, because it helps us to resolve perceptual contradictions, such as (to take an extreme example) a hallucination being and not being in the same place as a table and chair. So, we take it for granted.

Logic is quite able to deal with these issues in formal terms, through special kinds of conditionings, which may be called *'domain specification'* propositions. We can thus say: 'It physically appears that X is Y', whereas 'It mentally appears that X is not Y'. So conditioned, the statements 'X is Y' and 'X is not Y' may be both factually true and yet not in contradiction to each other.

A statement about physical appearance may be further delimited by specifying the sense organ(s) on which it is based. Likewise, a statement about mental appearance may be more precisely specified as an imagination in an awake state, or while asleep, or as a hallucination induced in such or such a way.

These forms are not new inventions, but are used in everyday practice. For examples: 'I dreamed she had left me, but when I woke up I found her still there' or 'The surface seemed smooth (visually), but when I touched it I realized it was rough'.

Clearly, there is still a need for reconciliation of sorts, but it is not as pressing as it would be without domain specification. The reconciliation may consist in granting preponderance to one of the statements (for instance, awake experience is more credible than asleep), or making a compromise statement (for instance, the surface is smooth or rough to a limited degree).

3. Concrete and Abstract

a. We experience the world as an enormous space, in which are a multiplicity of individual entities, which have a

diversity of attributes and mutual relations; in time, these come or go, move, alter or remain, and interact, in innumerable ways. (This brief description makes no pretensions to completeness.) These things, be they real or illusory, are apparent. They are experienced *in both* the physical and mental domains. But what are they?

Concretely, all we can point to in either domain are individual phenomena like: blobs of green or blue, noises, odors, bitter-sweet, penetrability, texture, temperature — in short, the perceptible qualities. Everything else we ever discuss is *'abstract'*.

The distinction of the concrete is its conspicuousness, it stands out; but the abstract is also somehow apparent, even though not manifestly so. The concrete as such seems more obvious, so we regard it as less open to discussion about how 'real' it is. The abstract as such is invisible, inaudible, you cannot touch it, smell it, taste it, it has in itself no perceptible quality — so we wonder how 'real' it is, if at all.

We all implicitly believe that the physical domain consists not only of concretes, but also and mostly of abstracts. Ironically, the concrete aspects of the physical domain are regarded by us as the least 'real' expressions of matter. Space, time, numbers, particles, waves, movements, forces, are all essentially abstract aspects.

Likewise, the mental domain is not limited to its perceptible qualities, but includes invisible, inaudible, and in no way perceptible, components. Furthermore, just as many of the physical domain's concrete aspects have equivalents in the mental domain, so they have many abstract aspects in common.

b. Now, the questions arise, what are abstracts and how do we know them? If we cannot perceive them, can they be said to have any existence or reality, and how can they be in any way described or discussed?

Most people and many philosophers, focusing primarily on the material world, try to answer this question with reference to mental images. The abstract 'squareness' of concrete physical squares, they say, is a mental image we call up and match against them. However, this proposal does not solve the problem.

In the example given, all we are doing is comparing a concrete mental square to a concrete physical one: the abstract squareness they have in common, on the basis of which a match is made, remains unexplained. Furthermore, the example given is a relatively concrete one; the suggestion becomes irrelevant in more abstract cases. For examples, in ‘possession’ or ‘action’ or ‘force’ or ‘causality’ or ‘entropy’ or ‘relativity’ — there is not only no physical concrete to point to, there is no mental concrete to point to (though concrete and abstract factors may be allied).

Relegating physical abstracts to the mental domain is a useless exercise, for the simple reason that mental abstracts are equally imperceptible there. The problem is only *once removed*, swept under the carpet, it is in no way solved. (The same argument can be made, incidentally, with regard to any other domain, like Plato’s transcendental world or Kant’s noumenal world.)

At this point we might be tempted to regard all abstracts as unreal, no more than meaningless words, for both the physical and mental domain. Some philosophers have attempted this.

But here again, logic intervenes. How can such a claim have any credence, if it consists of meaningless words. Either the statement is presented as meaningful and true, in which case it tacitly admits what it tries to deny, being filled with implicit references to abstracts, or the statement itself is meaningless and unrelated to reality, in which case how can we even consider it.

c. This leaves us with only one alternative. Namely, that some abstracts do really exist, even though they are imperceptible, and we are able to ‘experience’ them somehow, even though we do not know quite how. This position is logically tenable — it is relevant and consistent, unlike the other two.

We could still say that all abstracts are mental, but there would be no basis for such a discrimination. Once the experience of imperceptibles is accepted for the mental domain, there is no reason to exclude it in principle from the physical one. It would be an arbitrary complication, without specific justification.

I suggest, therefore, that ***there are abstracts in both the physical and mental domains***, as we presume in common-sense. This means that abstracts are immanent within things; just other

components of things, besides their concrete aspects, and as real as them.

This is not a claim that whatever abstract we assign to something is indeed there, but only an admission that *some* abstracts are there and somehow known to be there. Some abstracts are *not* there, even though believed to be there. We cannot make sweeping generalizations either way.

With regard to the *physical* domain, concretes are as a rule perceived through the senses. As for abstracts, some are known directly; they are on the surface of things together with their concrete aspects (e.g. the squareness of two squares). Other abstracts are known indirectly, and more fallibly, by imagination and inference from concretes and directly known abstracts (e.g. the chemical composition of water). Likewise, with regard to the mental domain, except that perception is inner.

4. Presentative or Representative

An appearance may be merely *presentative*, a phenomenon without pretensions (we say, 'in itself'), or it may be *representative*, a phenomenon which seems to signify something beyond itself. In the former case, it is merely 'an appearance', in the latter, it is 'an appearance *of*' something. For example, a piece of paper is just that, whereas the words or drawings on it are intended to refer us to other things as well as just being what they are.

A daydream or dream, a psychic mood, a word or sentence uttered as mere sounds or written as mere shapes, taken in themselves, are just givens; they become questionable only provided we assign some interpretation to them.

We commonly err in judging a mental experience to be physical, or to 'represent' an unexperienced physical one; taken as they appear, these mental phenomena are empirical; what is hypothetical is their characterization as specifically physical. If we imagine a 'talking horse' without making claims that it does or can exist in the physical world, all we have is an 'empirical' mental phenomenon; this phenomenon becomes 'hypothetical'

only as soon as we propose, for instance, that it has an analogue in the physical domain.

Some of our ideas are formed by idle manipulations of images or words, in the way of *experiments* to be tested. We try out new reshufflings of elements which were originally given in specific combinations, to find out whether these inventions also have or can be made to have a similar existence. Thus, for instance, we may wonder whether any ‘talking horses’ exist or can be genetically engineered.

Many of our ideas are formed *by analogy*. There is a use of analogy whenever we classify things together, under a vague impression that they are in some way alike, and assign them a common name. Often the argument by analogy consists in extrapolating some phenomenon from one domain to the other, or from some field within a domain to another.

Thus, for instance, whereas physical pleasure and pain are concretely manifest in the body, mental pleasure and pain are more elusively abstract; our idea of the latter may be formed by saying that they are ‘something like’ the former, ‘except in the mental instead of physical domain’. Likewise, psychological sickness may initially be merely an analogue of physiological sickness. Or again, I assume that other people’s minds are very similar to my own.

In some cases, we have doubts concerning some aspect(s) of empirical phenomena. Most phenomena seem to us to be clearly physical or mental. But some are not obviously the one or the other: an optical illusion or a hallucination may require an effort to categorize. The empirical force of concretes seems greater to us than that of abstracts. More broadly, some insights seem evident from the start; others require considerable work to convince us.

Taken neutrally, any impression we have, any idea that comes to mind, whether concrete or abstract, whether concerning the physical or mental domain, has the status of a presentation; it is in itself ‘empirical’ (in the largest sense), the moment it but appears to our awareness. What qualifies it as ‘hypothetical’ (as against ‘empirical’ in a more stringent sense) is any suggestion

it might inherently be making (implicitly or explicitly), that it relates in a certain way to something else.

Although 'hypotheticality' always entails some mental construct, it is not the mental aspect, as such, of its existence which makes it 'hypothetical', but rather that it refers the mind from one thing to another. The act of hypothesizing is indeed mental; but the contents of the hypothesis may be physical or mental, concrete or abstract, whatever.

It is not *what* kind of thing we focus on, which determines our empiricism — but rather, *how* we regard that thing. Whatever we perceive or conceive is always given and 'real', provided it is taken 'in itself'. To the extent that we draw inferences from it, it is of course fallible. An inference may be true or false; it is true, to the extent that predictions fit the evidence, and false, to the extent that they fail to.

14. CONSCIOUSNESS AND THE MIND

Drawn from Future Logic (1990), Chapter 61.

My purpose here is to propose a consistent framework and terminology for epistemology.

1. A Relation

Consciousness is a specific, peculiar kind of *relation* between an entity like ourselves (called the Subject); and any 'appearance', 'phenomenon', 'thing' which presents itself to us (called the Object). One can figuratively view consciousness as a line stretching between subject and object. (Capital letters are sometimes used for these terms, to avoid confusion with the use of the same words in other contexts, note.)

Consciousness is itself, of course, a phenomenon — one very difficult to grasp and define, because it is such a fundamentally unique and distinctive part of the world. We are here merely indicating it, without presuming to know what it is much more precisely, or just how it works.

The point made here is just that it is primarily a relational phenomenon, a placid 'seeing'; it is not itself an activity, though many activities surround it. The 'effort' of attention or the 'state' of being aware or the 'activity' of thought, are secondary aspects of this phenomenon, which depend on the relational definition for their understanding.

The reason why consciousness is best described as 'a relation', is that we cannot consistently claim that consciousness is 'subjective', because that claim is itself an event of consciousness which has pretensions of being 'objective'. This means that *the subject and object must be related by consciousness in such a way that neither affects the other when they are so related.*

Consciousness, then, is a relation which is neither passive nor active. Consciousness cannot be said to consist of changes of or

within the subject caused by the object, because such changes would not guarantee the existence of an object, let alone that the same object would always cause the same change or that different objects would never cause the same change. And consciousness cannot be said to consist in a creation by the subject of an object, because we would still have to explain how the object is apprehended once produced.

The ***Subject*** is itself also a phenomenon — again, one very difficult to grasp and define, because it is such a fundamentally unique and distinctive part of the world. We can say that it remains unaffected by consciousness or its Object. If consciousness was passive or active (as above defined), the Subject would be unable to be conscious of itself, not even hypothetically.

The ***Object*** is, note well, whatever presents itself to us, as it stands — without initial concern as to whether it is to be regarded as 'real' or 'illusory': these are later judgments about the object. The Object, likewise, remains unmoved by consciousness or by the Subject as such.

What matters here is that ultimately all consciousness is essentially observation, by someone, of something. The nature or type or source or status, of observer, consciousness, and observed, are other issues, which philosophy indeed has to discuss at length and try to resolve, but which need not concern us at this stage.

Whether the object is faced by the subject with detachment, dispassionately, objectively — or the subject is unwilling or unable to 'distance' himself from the object — these are attitudinal aspects, which pertain to reaction and do not affect the essentially 'observatory' nature of consciousness.

The existence of the object is immediately given in its appearance as a phenomenon. However we interpret what has appeared, we can be sure that *something* has appeared. If nothing had appeared, there would be nothing to discuss. The existences of subject and consciousness are not so obvious, a reflection of sorts is required to notice them.

Objects seem to be of various substance: some seem 'materially concrete' (e.g. a stone), some 'mentally concrete' (e.g. a dream);

some seem 'abstract' (e.g. entropy or humaneness). Subjects are believed to be of a substance other than such material or mental entities: we view them as 'spiritual entities' or 'souls'. Consciousness also seems a very special component of the world.

We sometimes label our awareness of subject and consciousness jointly as '*self-consciousness*'. For us humans at least, that awareness seems to peripherally accompany our every cognition of other objects, if only we make a minimal effort to activate it. This direct impression is further confirmed indirectly, by observation of other apparent people and higher animals. The extrapolation from object to consciousness and subject seems obvious to us.

We know very little about what constitutes a Subject, what gives some existents the power of cognition. Judging by their behavior, humans and higher animals have it (animists believe that all things have consciousness to some degree).

One cannot postulate that consciousness is bound to be distortive, without thereby putting one's own skeptical principle in doubt. It would not, however, be inconsistent to claim that *consciousness is occasionally distortive*. The power of our consciousness is evidently more or less limited; only God is viewed as omniscient.

2. Kinds of Consciousness

The term consciousness is to be understood generically. In common to all *kinds* of consciousness, is the central fact of consciousness, seemingly always one and the same Subject-Object relation.

a. Consciousness is called by different names, with reference to **the kind of phenomenon which is its object**. But this does not imply that the consciousness as such as structurally different in each of its subdivisions.

Thus, we call ***perception***, consciousness with a concrete phenomenon as its object; and ***conception*** (or ***conceptual insight***), that with an abstract phenomenon or a phenomenon mixing concrete and abstract components.

Identification is consciousness of the identities between parts of a phenomenon or between two or more phenomena. ***Distinction*** is consciousness of the differences between parts of a phenomenon or between two or more phenomena. Since similarity and dissimilarity are in themselves abstract aspects of phenomena, such *comparisons and contrasts* are conceptual. These insights allow us to *discern* the various constituents or aspects of individual phenomena, and to *classify* several phenomena together or separately.

Understanding refers to consciousness of the causality (in the largest sense) of phenomena — the natural causes of material or mental phenomena as such, or the meanings or explanations of ideas. Understanding is primarily a consciousness of the order of things; it is conceptual, since causality is an abstract phenomenon. The reaction of fulfillment or satisfaction which follows such insight is secondary.

b. Consciousness is classified variously, with reference to **the location in space or time of object**.

Thus, we label consciousness as ***introspective*** (or inner) or ***extrospective*** (or outer), according to whether its object is placed inside or outside of us (the terms are ambiguous, depending on how much we consider as being 'us' — our minds, our bodies, or even our segment of society).

The objects of perception are ordinarily temporally located in the present. Direct perception of long past or future events seems impossible to us — though prophets are said to have this power. ***Remembering*** concrete events seems to be perception of present mental images of past events, rather than of the events themselves.

Conception, however, does not seem equally bound by time, in the sense that we can more or less ***predict*** past events from their present effects, or future events from their present causes, or either of them from general laws. Such predictions are conceptual insights, even when they concern concrete events, in that the premises of the conclusion are abstract relations. Still, the result is a consciousness of past or future, so we are justified in saying that (predictive) conception as such transcends time: the subject and object are related by it across time.

c. Many subdivisions of ‘consciousness’ refer to **the attendant processes**, as well as to the location and kind of phenomenon. But that different processes lead up to an event of consciousness, does not in itself mean that their result is essentially different; once consciousness is aroused it may be one and the same.

Thus, perception mediated by activity of the sense-organs is called ***sensory*** perception (or sensation). It is called seeing, hearing, tasting, smelling, touch-feeling, according to whether the eye, ears, mouth, nose, or touch-organs, were involved. The perceptions of various pleasures and pains in one’s own body, and of movements or stillness in or of one’s own body, are also sensory, and called feelings (sentiments, if to be distinguished from touch-feelings).

Perception of mental images could be called ***‘intimate’*** perception. (I adopt this label for lack of a better one; the colloquial expression ‘mind’s eye’ might be more fitting were it not for its limiting suggestion of visual images.) It is hard to classify this as sensory perception, in that the usual sense-organs do not seem to be involved (though the brain supposedly plays an analogous role of some sort). But it is still a form of perception, insofar as its objects are as ‘concrete’ as material ones, though mental.

Some people claim, correctly or not, powers of ***extra-sensory*** perception (ESP). That is, the ability to perceive events which are outside one’s own mind and body, and beyond the normal range of the sense-organs. We might distinguish ESP of purely material phenomena, *clairvoyance* (say), from ESP of mental phenomena or material phenomena linked to mental ones, *telepathy* (say).

I cannot personally claim to have ever experienced clairvoyance, but I have had the impression of telepathy (for example, thinking of someone and almost immediately getting a phone call from that person) often enough to discount coincidence. I remain open to the idea, without insisting on it, on the grounds that thought-transmission (awake or even in dreams) could be too fragile to withstand the stress of scientific probing. In any case, I mention ESP here, only for purposes of taxonomy.

Conceptual insight may be ***intuitive,*** immediate and direct, as when we 'see' as obvious that two entities are in some way alike or that two statements are contradictory. Or it may be ***reflective***, final and indirect, occurring at the end of a long and tangled effort of thought, comprising sensory and imaginary experiences, and inductive and deductive reasonings — a complex of perceptions and conceptual insights.

The immediate and final insight are essentially the same in character; the process leading up to the latter may be regarded as only ***a preparatory positioning of self, faculties of cognition, and objects***. The process merely 'shows' us the object, presents it to us, but we still need to 'see' it.

Conception is considered less immediate, direct and spontaneous, than perception, but there is no reason to think so. Both usually involve a process, an alignment of self, faculties, and objects, plus an effort of attention. We may or not be conscious of the preliminaries. What counts is the terminal event of perception or conception as such. That singular event has a certain, specific character, whatever its own causes or the nature of its objects.

Imagination is not in itself a kind of consciousness. It is a complex of three factors: the ('voluntary' or 'spontaneous') *act* of projecting a concrete mental image or abstract mental construct, the image or construct projected as an *entity* in itself, and the eventual consciousness of that finished product. The precedent projection is merely a creative activity of the will or nervous system; only the subsequent observation of its result properly qualifies as consciousness. The source of the object is irrelevant here, just as we would not regard the making of a table as part of seeing the table.

The images formed by imagination exist without doubt; we experience them daily. Some obvious instances: our thoughts are expressed as imaginary sounds; our dreams may clearly depict people we know. Such images are, however, considered as made of *a substance distinct from common matter, which we label 'mental'*. This mental substance, like common matter, has both concrete and abstract components.

Concrete imagination, or '**perceptualization**' is projection of concrete mental images of any kind. This includes not only visualization (visual imagination), but also its equivalents in the other sense phenomena (auditory, olfactory, gustatory, tactual, emotional). Abstract imagination, or '**conceptualization**' is projection of abstract mental constructs of any kind.

The expression 'projection of images' suggests the existence of a mental *'matrix'* (let us call it) in which the images are formed or imbedded. This might be viewed as a multidimensional screen, capable of displaying visible, audible, and other phenomena. I find this idea occasionally convenient (to replace the broader word 'mind'), but it need not be taken literally, because the images might be 'holographs', of a common substance but without a substratum.

The words ***percept*** and ***concept*** may here be explicated. We often intend them in the sense of 'thought-units', but I prefer to stress their alternative sense of *objects* of perception or conception. A concrete object of perception should be called a percept, like the green we perceive; an abstract object of conception, should be called a concept, like the greenness we conceive.

A percept is always concrete (meaning, it has perceptible qualities); it may be physical (ordinarily implying sensory perception) or mental (the object of intimate perception). In the latter case, it may have been actively fashioned by us or have arisen involuntarily: perceptualization is implied. Exactly likewise, a concept is always abstract; may be physical or mental; and in the latter case, may have been willed (reflective conception) or passively experienced (intuited): conceptualization is implied.

In practice, because concrete and abstract factors are intertwined in the objects we commonly face, we sometimes broaden the word 'concept' to include percepts as well as concepts. Alternatively, we apply the word 'percept' to all physical phenomena, whether concrete or abstract, and 'concept' to all mental phenomena, whether concrete or abstract: this reflects an understanding that there is no essential difference between perception and conception.

All these, however called, are in themselves objects. But besides this characterization, mental objects may additionally have a representative intent, as we saw in the previous chapter: they may make claim to some analogy to physical objects, or other mental objects. In themselves, all objects are empirical facts; the characterization as fiction only concerns claims of representation, whether the imagined object was perceptualized or conceptualized.

Lastly, note, consciousness may be ***verbal*** or ***wordless***. The role of words has been discussed in an earlier chapter. They help us to think and communicate, and play a role in remembering. Wordless consciousness is sometimes called 'subconscious' — we learn or imagine, decide or intend, but without comment.

But all use of words implies an underlying consciousness of the meaning intended (meaningless sounds or written symbols do not strictly qualify as 'words'). Words in themselves are just objects; they play no role if we are not conscious of them, and if we are only conscious of them they have no meaning. They should not be confused with the underlying consciousness of what they are intended to refer to.

Words may refer to percepts as well as concepts, or to complexes of both. Words facilitate imagination, especially conceptualization. In the latter case, words are very valuable, because they are concrete, and concrete objects are easier to manipulate and hold on to than the abstract objects they are standing in for. However, even then, for the verbal construct to have meaning, there has to be an underlying reshuffling of abstract elements. Needless to say, the resulting fiction may or may not have a factual equivalent. Either way, it is not strictly the word combination itself which is fact or fiction, but the construction that they propose.

3. The Mind

What we call 'the mind' is a grab-bag of many things. It collects together: the self or **soul**; our faculties of **cognition** and **volition**, and **imagination** and **affection**; and the various states and

motions of those faculties, and entities produced by or through them.

The *soul*, the spiritual entity which is our self in the deepest sense, is the unaffected Subject of consciousness and Agent of will.

The soul occupies a central position, surrounded by certain faculties. By a *faculty* we mean, the structures underlying an ability to perform a certain function. These infrastructures are specific arrangements of physical entities, which make possible the sort of event referred to. They are known to biology as the nervous system, and include our brains and sense and motor organs.

These biological faculties, then, constitute the physical conditions under which cognition and volition can operate. As earlier posited, cognition is essentially a relational phenomenon; likewise, volition. The states and motions which surround cognition and volition, and the entities these may result in, concern the underlying structures, and are not to be confused with cognition and volition as such. Their role is merely to provide supporting services to these functions.

Different animal species and individuals have differently structured faculties, and therefore varying powers of cognition and volition. Machines and computers are assumed to lack souls, and therefore can never be Subjects or Agents which engage in cognition or volition; they are at best as passive and mechanistic as nervous systems.

The soul is viewed as substantially different from the nervous system; they are not a part of each other, though contiguous or inhabiting the same place. The soul is *in no way internally altered* by cognitive or volitional or surrounding physiological and physical events; only the nervous system undergoes alterations, whether by the soul’s apprehensions and actions or by events in the rest of the body or beyond it.

However, the *sphere of influence* of the soul may be maximized or minimized, according to the structural condition, and present states and motions, of its allied nervous system. This means that the soul’s previous cognitions and volitions, or even external events, may — through their alterations of the nervous system

— make *more easy* (facilitate) or render *more difficult*, or even permanently arrest (in the case of irreparable damage to the nervous system), the soul's later powers of cognition and volition. It may have to go through A, B, C to get to D; or it may have D immediately available.

Thus, the soul can be said to be an 'unmoved mover', without thereby implying that its powers of cognition and volition are unlimited by physical conditions. The ethical doctrine of freedom of the human soul is simply that certain powers of cognition and volition remain inalienable, even when much complicated, so long as life goes on and the relevant organs are undamaged.

The faculties of imagination and affection are merely tributary aspects of cognition and volition. *Affections* (ranging from love to hate), for instance, are inferred from the attitudes (positionings) and expressions (actual directions) of the will, and from the content and intensity of correlative passions — bodily pleasures and pains (sentiments), and mental ones (emotions), before or after action.

Thus, to summarize, what we call 'the mind' is a grouping of disparate things: a central soul (with Subject and Agent capabilities); surrounding faculties (biological infrastructures, organs) which enable, delimit, and assist its cognitive and volitional relations to other things; and a power of the soul and nervous system to produce the special entities we call mental images.

The mental entities we imagine are evidently such that they can be formed either 'spontaneously' by the nervous system or 'voluntarily' by the soul. These are intimate experiences we all have. I suspect that in the latter case, the soul produces mental phenomena by acting on the nervous system, rather than directly (this would be the simplest hypothesis, since it adds no extra assumptions).

The *interactive properties* of soul, matter (the nervous system and the physical world around), and mental images might, in conclusion, be described as follows (I go into such detail to show the theory's precision):

a. the soul itself cannot be altered by matter or mental phenomena, though (i) it can seemingly be pushed around space by matter, (ii) the sphere of influence of its will can be increased or diminished by the states of matter, and (iii) it is sometimes 'incited' to acts of will by mental images;

b. the soul can, through its will, alter matter (only through the nervous system — unless we grant telekinesis), though this power of volition has precise bounds;

c. the soul can, through its will, produce mental images (the latter probably only via the nervous system), though this power of imagination has precise bounds; if we grant telepathy, a soul can transmit mental images to other souls, or be presented with mental images transmitted to it by others (it is doubtful that this would occur via matter);

d. the nervous system can directly produce mental phenomena — but other matter (and probably the soul) cannot do so, except through the nervous system;

e. as for whether mental phenomena as such can directly affect matter — I see no reason to suppose so, since indirect explanations seem sufficient: (i) in the case of imagination by the soul, the soul acts on the nervous system with that intention, but the nervous system may yield unintended side-effects in the rest of the body (and thence beyond); (ii) in the case of involuntary imagination, the nervous-system events which produced the image may simultaneously have other effects in the rest of the body (and thence beyond); (iii) alternatively, the soul's perception of (voluntary or involuntary) images may incite it to act (or act again) on the nervous system (and thereby beyond);

f. I doubt that mental phenomena can affect each other directly, in the way that physical ones do; this may be the most telling distinction between the two domains.

Note lastly that I do not intend the statements made here concerning the soul as dogmatically perfect and final. My concern has been to specify the logical requirements of a coherent theory of the consciousness and volition relations: what is sure is that the subject or agent must be unaffected, *within that relation*. But I do not exclude offhand the possibility that souls

may undergo change as a result of other relations, or spiritual events.

It is noteworthy that religion suggests, and many believe, that souls (as well as having been created and being perhaps in some cases permanently destroyed) may be 'purified' or 'sullied' by their thoughts or actions. However, such improvement or deterioration of a soul is explained as a subtraction or addition of coatings of 'impurity' *around* the in itself clean soul, rather than as an intrinsic qualitative change. The 'impurity' interferes with clarity of insight and freedom of action; it 'weighs down' the soul, causing it to descend on the spiritual scale, and thus distancing it from God.

4. Popular Psychology

Some philosophers exclude the soul from the description of mind, arguing that the self is merely the sum total of the other elements. But that view is logically untenable, because it raises the specter of 'subjectivity'. As earlier pointed out, the Subject of consciousness must be such that it is unaltered by events of consciousness; if we equate self to the altered elements of mind, we transgress this logical requirement. The reason why the soulless hypothesis seems at first sight to have some credibility, is as follows.

Many people have a vague notion of the mind, regarding it as a sort of psychical organ over and above the brain, with parallel functions and mutual influence. Here, the mind is regarded as a sort of cupboard, made of some nonphysical substance, in which we store entities like 'ideas' and 'emotions'. When these are placed in the lower shelves, they are held 'unconsciously', in the middle shelves, 'subconsciously', and in the upper shelves, 'consciously'. Thought is accordingly viewed as the production, alteration and movement of such entities.

Some versions of this hypothesis explicitly or tacitly admit of a soul above, next-to, or within the 'mental cupboard', which to varying degrees experiences and to some extent manipulates ideas and emotions. Other versions effectively identify the soul with the 'mental cupboard', to admit that someone is doing the

seeing, feeling, and manipulating. Still others, effectively deny the existence of a Subject and Agent, and view these events as physically-caused or relatively causeless.

However, this ‘mental cupboard’ postulate of popular psychology is simplistic. There is no basis for considering ideas and emotions as persisting, continuing to exist as mental entities somewhere, beyond the time when they are actually experienced. It is much simpler to regard them as merely occasional ‘peri-phenomena’ of the physical organs.

It is sufficient to say that to each idea or emotion there corresponds a specific chemistry in the brain cells. When the appropriate molecules are constructed and properly positioned, the mental entity is created; when thereafter the circuit is cut off, the mental entity ceases to exist. What is stored are the molecules, not the idea or emotion; the latter is recreated every time the former is re-activated.

In that case, the ‘mental storage cupboard’ is an extraneous construct. If we postulate it, the role of the brain becomes incomprehensible. There is no point in our assuming duplicate functions; it is a needless complication. Thus, actual ideas and emotions are mental phenomena, but their potentiality is a physical phenomenon.

In conclusion, then, *there is no such thing as a mind, in the sense of a mental structure or ‘psyche’*. There is only a uniform, unchanging soul, which experiences and wills as its way of relating to other things, a nervous system serving as physical infrastructure, and *from time to time* the production by these of transient mental apparitions. This scenario is by far simpler, more logical, and more empirical.

15. PERCEPTION AND RECOGNITION

Drawn from Future Logic (1990), Chapter 62.

In this chapter, I want to specify some of the logical preconditions for any theory of knowledge. Some such criteria have of course been developed throughout the present treatise, here my concern is with issues relating to the role of the nervous system.

The intent is not to present a complete and definitive model of knowledge, but merely to demonstrate how a theory of cognition and memory must be tailored around certain fundamental insights of logic. Proposals falling short of these specifications may be rejected at the outset as without credibility.

1. The Immediacy of Sense-Perception

There is a very important first principle for all philosophy, all ontology, all epistemology, all science, supplied to us by logic. It is that ***we cannot consistently deny the ultimate objectivity of (some) knowledge***. We cannot logically accept a theory of knowledge which in effect invalidates knowledge. (I personally learned this insight from Ayn Rand, though I seem to recall that she attributed it to Aristotle, in spirit at least.)

This means that ***the currently popular view that sense-perception is no more than a production of mental images — is logically untenable***. Such a statement might at first sight seem ridiculous, since it denies something universally accepted as common-sense, not only by most lay people, but even by some major philosophers and many scientists; however, bear with me, and we shall see its logic.

Ask anyone to express the work performed by our senses, and they are likely to reply: ‘light or sound or whatever impinges upon the corresponding sense-organ, and produces an electrochemical message, which is transmitted to the brain, where it is somehow translated into a mental image — which is

what we in fact perceive in sense-perception (rather than the external physical phenomenon itself)'. To evaluate that position, we must make a distinction between its descriptive and interpretative aspects.

The description is given us by common experience and research by biologists. Sense-organs (from sense receptors to brain centers) play some crucial role in perception, since if they are blocked or damaged it is affected, and they have such and such a physiological configuration and manner of functioning. That is the empirically evident data underlying the above statement, and I am not contesting it.

On the other hand, the interpretative element is the belief that what we perceive, at the tail end of the described processes, are 'mental images', psychological phenomena which hopefully 'resemble' the original physical phenomena, produced in the brain somehow. This is a theory, which is open to question on purely logical grounds: if all what we perceive are 'mental images', then how can we know that these are images *of* anything, and even if they are, how can we know they in any way *resemble* their physical causes?

More specifically, our descriptive knowledge of the sense-organs and their processes, becomes no longer empirical but a mere postulate, which therefore cannot be used to confirm the theory. If our apparent perception of our body and the physical surrounds may itself only be a day-dream, as the theory suggests, it cannot be used as empirical evidence that there is a body surrounded by a physical world which together produce mental images.

Thus, though the theory in question begins with a presumption that there is a material world (including the sense-organs and external stimuli), it ends with a possibly contradictory logical conclusion that there may well not be such a world, precisely *because* our knowledge of it is mediated by the senses. On the one hand, it views its data on the pathways of sensory messages as *physical* evidence for itself; on the other hand, it goes on to possibly deny the reality of such physical evidence.

Had we not begun with a presumption that there is a material world (radically distinct somehow from the immediately

knowable mental world), there would have been no need to construct a theory relating certain perceptions to the sense-organs. All objects, whether mental or physical, including the sense organs, would be of the same, essentially fantasmatic, stuff — and thus all equally directly knowable.

An issue only arises when we take for granted the common-sense view that there is a physical (as against mental) world, from which the perceiver is separated by a body with sense-organs. This view is credible, since mental and physical phenomena do experientially seem to us somehow substantially different. It follows that the theory in question intrinsically presupposes (logically implies) that the descriptive data is specifically physical.

We thus have two modal hypothetical propositions in contradiction: 'if the theory, then the data may not-be physical' and 'if the theory, then the data had-to be physical'. The antinomy involved is not of the form 'if P, then nonP', but of the form 'if P, then both 'possibly not Q and necessarily Q', which implies 'possibly {nonQ and Q}'. A theory which denies its own starting point has no logical standing.

The objects of sense-perceptions cannot be claimed to be mental images of otherwise inaccessible physical phenomena: because, if they are *inaccessible*, how can the proponents of that theory claim to have *access* to them and know anything about them?

They cannot logically lay claim to any underlying physical events; and even if they do, what guarantee have they that the mental images perceived have any *resemblance* whatsoever to any presumed physical causes? An effect need not resemble its cause. Thus, it may well be that, say, the mental image of 'green' is invariably caused in everyone's mind by a physical event of 'square': no one could tell. No claim of 'truth' could be made by anyone — not even by the proponents of that theory (it is intrinsically unconfirmable).

But in any case, there would be no justification in regarding perception of 'externally generated' mental images as in any wise more mysterious than perception of 'inwardly produced' mental images: all phenomena would have the same status. The subjectivity theory constructs redundant 'duplications', with the

group of mental phenomena labeled ‘physical’ needing repetition as mental phenomena labeled ‘nonphysical’.

The problem has baffled philosophers, but I do not see why. If a position leads to paradox, logic demands that we simply reject it and find another. Here, although it is obvious that the apparent sense organs *indeed must play a significant role of some sort* in physical perceptions (since without them, it is lacking), the initial assumption that this role is production of mental images turns out to be inconsistent. Ergo, that assumption is nonsense, and some other explanation of the function of these organs must be sought.

To resolve the paradox, while maintaining that the data is indeed physical, we are logically forced to conclude that sense-perception (no matter what many people believe), is a *direct, unmediated* relation of consciousness, between the physical objects and the perceiver. We must accept that **when we perceive an external object, *it is the object itself and not some ‘representation’ of it that we in fact perceive*.** We must from the outset admit the *objectivity* of sense-perception.

We must accept this primary logical requirement, and build our theory of knowledge around it. There is no escape from the logic. Thus, the light from a material object, its activity in the retina of the eye, the messages sent on to the brain — all these physically evident intermediaries of sight must be regarded as *mere causal preliminaries*, preparing us somehow for the actual act of seeing, which however is an unhindered Subject-Object relation. Likewise for the other senses.

(The computer provides us with an interesting analogy, though a partial one. The Subject keys in a statement he is reading on his table. The keyboard and CPU/Disk of the machine represent the sense-receptors and brain; the changes produced in the machine correspond to the nervous impulses and imprints; the partial display on-screen are analogous to mental images. But note well that the Subject sees both the external object and the on-screen copy if any, and is not himself to be confused with the machine.)

Philosophy is still left with the task of proposing alternative explanations for the role of the sense organs and their processes

in physical perception. Starting with the admission of the common-sense view that there are physical, as distinct from mental, phenomena (including our bodies), manifold functions may be suggested offhand:

a. Some have recently suggested that the senses may serve to *filter out* impressions *other than* the ones focused upon. It may well be that the senses produce a preliminary, relatively rough, mental image which allows us to decide whether we are sufficiently interested in the underlying object to awaken and invest a further effort of (more direct) consciousness towards it. Indeed, analysis of sensory messages seems to indicate that their content is relatively skeletal.

b. Perhaps the sense organs serve to somehow pin-point a consciousness which would otherwise be too general. It may be that the awareness of a disembodied soul would be too dilute to be effective in this world, like the state of mind called 'enlightenment' pursued by mystics. The senses may provide a material framework, a set of physiological conditions, in which an adequate 'line of relation' between perceiver and physical percept can be established, a 'pipe' though which a ray of consciousness can be sufficiently intensified.

c. It also seems likely that mental images are indeed simultaneously produced by sensory messages (always or often, automatically or by choice), *as an incidental side-benefit, for purposes of future recall*. Whether the sensory-messages produce both the nervous-imprint and the mental image, or (less likely) it is the actual perception which produces the mental image, independently of the nervous-imprint, I do not know.

These are just suggestions which come to mind; there may be better explanations. But in any case, the suggestion that the function of the senses is exclusively the production of mental images, which are all that we perceive, is logically unacceptable, and therefore wrong without a doubt.

Whatever the biological processes involved, then, at the moment of sensory perception (and, it seems to me, lingering on for a brief time thereafter, at least in some cases), the perception is direct. That the physical perception is thus direct, does not guarantee that it is complete, nor that it is pure of additional

projections of an interpretative nature, note well. But if we are properly attentive, we can focus on the given exclusively.

An image may indeed incidentally be formed in the brain, for purposes of preliminary filtering and/or future recall. Such an image may be a clear and faithful mental ‘photograph’ (or ‘phonograph’ or whatever, as appropriate), or a vague and distortive one, but the initial perception relates to the object itself, not this image. This, to repeat, is a logical necessity.

It may be that we have some difficulty in accepting sensory perception as direct, because we tend nowadays to regard the soul as localized ‘in the head’, contiguous with the brain. This creates a physical *distance* between the perceiver and the things perceived, which are located at the other extremities of the sense organs. But it may well be that the soul is more extended than we assume, permeating the whole body; in that case, the issue of distance would be resolved.

With regard to introspective perceptions, they are generally of course accepted without question as irreducible primaries. This refers to concrete mental phenomena which are not, at the time they arise, stimulated by sensory stimuli, though they may well in the past have been, wholly or partly, given initial existence and form by sensory stimuli.

2. Logical Conditions of Recognition

But the main function of the nervous impulses generated by sensation (and similarly for nervous impulses underlying intimate perception), is production of biological imprints which are necessary to *recognition*. Not mental images, note well, but codes of a physical (meaning *non-mental*) nature in the cells of the brain.

When we perceive two objects *at the same time*, we can immediately ‘see’ (in the largest sense of intuitive insight) that they are ‘similar’ or ‘different’ in various respects. These direct comparisons may not at once reveal all the similarities and differences, and some of them may later be disagreed with and judged illusory — but in any case, these acts of consciousness are the primary building blocks of what we call ‘conception’.

Comparing simultaneous percepts seems simple enough, but what of comparison of percepts which are *separated by time*? It is hard to say that in such case we 'evoke' a mental image of the past percept and match it with the present percept, because introspection shows that in most cases we are able to construct only a very imperfect analogue of the initial impression, if any.

Indeed, even as we call the image up, we know the image *itself* to be (usually) only a rough copy of the original direct percept, which implies that we are able to compare the present mental image to the past object by some means *other than* with reference to a mental image. In other words, the image itself is liable to some judgment regarding its correctness.

It follows that our decision as to whether the perceptual object now facing us is or is not the same as some past manifestation, is not (or not exclusively) made through the intermediary of a stored mental image. How, then, are we able to *'recognize'* anything, how can we claim that we have seen anything before?

This is a logical problem, as well as a more broadly epistemological one, in that logical science is based on the assumption that similarities and differences are recognizable *across time*.

Our goal here is not to debunk human knowledge, for as we have seen such a reaction is logically untenable. Our goal is more humbly to determine the logical conditions for objectivity of knowledge. That knowledge is objective is indubitable, since the premise of subjectivity is self-contradictory. Two solutions to the problem may be proposed.

One, is to suppose that direct perception of past concrete objects is feasible; that long after an event is over, we may transcend time and space somehow, and sometimes 'see' it, the past event itself (not its present repetition or continuation), by extrasensory means. But this solution seems very far-fetched, even though not impossible to conceive. I have made attempts in that direction, but they are too speculative to include here.

Two, is to suppose that the distinguishable components of each concrete object (whether physical or mental) we perceive produce a certain *'nervous imprint'* (let us call it) in the brain, which is substantially a physical (rather than mental)

phenomenon of some sort. Such an 'imprint' may be a certain electrochemistry of the nervous cells — a molecular arrangement, a location or orientation of certain molecules, a specific combination of electrical charges — perhaps including a distinct synaptic network; whatever it is (it is for biologists to determine just what), we here predict it on logical grounds.

Thus, what happens in recognition is not comparison of the new percept, to the mental image of the old percept, but comparison of the nervous imprint of the new percept, to the nervous imprint of the old percept. If they match perfectly, the objects 'seem' identical; to the extent that the nervous imprints do not entirely fit each other, the objects are 'experienced as' dissimilar. This idea admits that not only sense-percepts produce imprints, but even mental images we construct voluntarily or otherwise may do so, note well.

In this way, even the mental image of an old percept can be judged as rough or accurate, according to whether the nervous imprint of the image is in all respects the same or only partly so, to the nervous imprint of the object it claims to reproduce. We may well suppose that the mental image is often a projection caused by the nervous imprint; this would explain why images which we normally find difficulty evoking clearly at will, may suddenly appear with force in dreams or under the influence of drugs, say.

The 'matching' of nervous imprints should not be viewed as a conscious comparison, but rather as a *subliminal* process whose end-product is a signal, directly perceived or intuited by the conscious Subject, that the objects in question, be they physical or mental phenomena, match to a greater or lesser degree. Note well, it is not the imprints themselves that we 'see', but some signal from them. Uncertainties may be explained by supposing that nervous imprints sometimes decay, or are lost; likewise, distorted memories may be due to deterioration of imprints.

In this way, past and present physical and/or mental objects are comparable. This theory frees us of the problems associated with the idea that mental images are the intermediaries of recognition across time. However, it contains logical difficulties of its own! What guarantee is there that an old nervous imprint has not been

distorted, so that we ‘recognize’ a new object which is in fact unlike the old, or fail to ‘recognize’ a new object which is in fact like the old?

The only solution I can think of is ‘holistic’. To claim that such confusions invariably occur would be logically inconsistent, since such a statement (again) would be invalidating itself. Therefore, logic demands that at least some such comparisons have to be admitted to be correct. The question of ‘which?’ can only be answered by a broad consideration of all experience and logical insight.

That is, over time, if such errors have crept in, inconsistencies will eventually arise, which will signal to us that something, somewhere, went wrong, and we will accordingly modify our outlook in an attempt to resolve the contradictions. In other words, the experiences of similarity or difference are phenomenal, and are taken at face value until and unless otherwise proven, like all other experiences.

3. Other Applications

a. Once we come to the realization that perception of physical objects (sensory perception) logically has to be as direct as perception of mental objects (intimate perception), it is much easier to accept the statement made in the previous chapter that conceptual insight also may be a direct Subject-Object relation, when its object is external as well as when its object is internal. Such immediate conception has been called intuition, in contrast to reflective conception.

The only difference between perception and conception is that the former is directed at concrete objects, and the latter at abstract objects. The only difference between sensory and intimate perception is that the former is directed at physical objects, and the latter at mental objects. A similar division can be made with regard to conceptual insight, whether intuitive or reflective, by reference to the physicality or mentality of the objects concerned. But in all these cases, the consciousness relation is one and the same phenomenon.

In conclusion, physical as well as mental concretes, as well as certain intuited abstracts, may be known directly and immediately. These, whether rooted in externally or internally directed acts of consciousness, serve as the raw givens of knowledge, and are *in themselves* indubitable. However, beyond these ‘received’ primaries, most knowledge is constructive, and open to doubt and review.

By ‘constructive’ is meant, that concrete or abstract mental images may be reshuffled in any number of ways, forming innovative, hypothetical entities. The ‘building-blocks’ of such imagination are given from previous, ‘received’ concrete or abstract experiences; but these may be separated from each other and combined again together in new ways. Such fictions are often effected by manipulation of allied words, but they may also be made wordlessly.

These constructs are to begin with imaginary, but some of them may eventually be supposed, with varying degrees of logical probability, to have equivalents which are not imaginary. Inductive work is of course required to confirm such suppositions. Fictions are of course not always deliberate imaginings for research purposes; they may be unintentional misperceptions or misconceptions, or only intended for entertainment or more obscure ends.

b. It should be obvious that what has in this text been referred to as a ‘nervous imprint’, is simply one of the senses of the word ‘memory’. I avoided that word, because it is variously used, also in senses which suggest renewed consciousness, or the reviewed objects, or actual images of previous objects — whereas I wanted to stress the subliminal aspect of memory, its material substratum.

Now, let us consider recognition more broadly. We suggested that when a percept (a concrete object of perception) is recognized, each of its many concrete attributes is encoded in the brain in some way, and matched against previous such nervous imprints.

Thus, there is supposedly a peculiar code for ‘red’, another for ‘hot’, and so forth, as well as for the various measures or degrees of such characteristics. We may similarly suppose that there is a

special code for each of an object's abstract attributes — that is, for each concept (abstract object of conception).

You may remember, we distinguished between two kinds of imagination: 'perceptualization', the projection of any concrete mental image, and 'conceptualization', the projection any abstract mental image. Whether such projections are voluntary or not, their recognition is effected in the same way.

Note well also that a mental image, whether concrete or abstract, may be recognized as resembling a physical phenomenon, in any respect other than the substantial one (obviously they will remain differentiated as mental and physical, respectively).

However, concrete and abstract phenomena, whatever their substance, cannot be equated to each other, though they may of course be in some way causally associated. In practice, of course, almost everything we consider is a mix of concrete and abstract components, so some comparison usually does occur.

Thus, recognition, in its widest sense, concerns any kind of object. Anything distinguishable in some way, be it physical or mental, concrete or abstract, is supposedly recognizable. Thus, recognition is ultimately recognition of what we call 'universals', the various components of things, which bundle together into what we call 'particulars' (more precisely, we mean 'individuals').

That is not to say that there is nothing more to a 'universal' than a distinct code, for the codes themselves are in fact just 'individuals' — but it is merely an observation as to what we may reasonably expect the nervous imprints, which we earlier posited, to correspond to. The point is that there is no essential difference between recognition of concretes and abstracts, be they physical or mental, however they were generated.

16. THE LOGIC OF INDUCTION

Drawn from Future Logic (1990), Chapter 67:1-2, 3(part).

1. Degrees of Being

Before determining where the philosophy of science stands today, I would like to highlight and review some of the crucial findings of our own research in this volume.

The first thing to note are the implications of certain of our findings in modal logic. We saw earlier that, contrary to what has been assumed throughout the history of logic, the premises:

> All M can be P and
>
> **This S can be P** (or: This S is P, or: must be P)

…do not yield the conclusion 'therefore, This S can *be* P', but a more disjunctive result, namely:

> therefore, This S can (get to) be *or become* P.

Thus, the mode **ppp** is valid, but only provided we take transitive propositions into consideration. Past logicians, including moderns, failed to take the existence of *change* into account, in their analysis of modal logic, and for this reason did not spot this important alternative conclusion from a merely potential first-figure major premise. It is true that Aristotle analyzed change with great perspicacity in his ontological works — and indeed, my own formalization of change is based on his insights — but even he did not integrate this relation into his formal logic.

The immediate formal significance of this finding is that ***natural modality is not permutable***. Although in common discourse we rephrase 'S can be P' as 'S *is* {capable of being P}' or as 'S *is* {potentially P}', in strict terms, we may not do so — we may

not enclose the modality within the predicate, and consider these 'is' copulae as having the same meaning as that in an actual 'S is P'. If this is true of potentiality, it has to be equally true of natural necessity, since the oppositional relations between modal forms have to be maintained. By similar argument, we can show that temporal modality is impermutable.

These *formal* findings force upon us certain *ontological* inferences of the highest import. I was myself surprised by the conclusions; I had not intentionally 'built them into' my system. The implication is, that we may not regard a potential relation as signifying the presence of an *actual* 'mark' in the subject; the subject contains, within its 'identity', the potentiality *as such*, and not by virtue of some actuality. Thus, ***there really are 'degrees of being'***. We may not reduce all being to the actual; there are lesser degrees of being, called potentialities, and (by extension) higher degrees of being called natural necessities.

In between these extremes, therefore, the degrees of natural probability are also different degrees of being. And likewise, temporal modalities have to be so interpreted. Note well, none of this is speculative: these positions are imposed upon us by formal logic, by the requirement of impermutability (which, incidentally, was also useful in understanding the Russell Paradox). Thus, we are not making a vague metaphysical statement, but referring to precise technical properties which reveal and demonstrate the 'self-evidence' (in the formal sense, of logical necessity) of the concept of degrees of being.

Thus, although the concepts of modality are at first presented as purely *statistical* characterizations of relations, we come to the final conclusion (on formal grounds) that this numerical aspect is *merely a symptom* of a real ontological variation in the meaning of 'is'. Aristotle left us with a limited vision of the scope of the copula 'is', because of the restrictions of his nonmodal logic; but now we see that there are *real nuances* in the sense of that copula, which only a modal logic can bring out into the open for our consideration.

We see, in this way, the impact modal deductive logic may have on ontology. But, as we shall see, the ramifications in modal inductive logic are even more significant, for epistemology.

However, beforehand, I would like to make some incidental remarks.

Until now, the formal theory of classification, or class logic, has been notoriously simplistic. No one can deny how valuable it has been to science: for instance, Aristotle, and in modern times the Swedish biologist Carolus Linnaeus, have used it extensively in constructing their taxonomies of plant and animal life, and indeed every systematization involves reference to genus-species-individual relations. However, this approach has always seemed somewhat rigid and static.

Our world is conspicuously a world of change. Things come and go, there is generation and corruption, alteration, development, and evolution. What was yesterday a member of one class, may tomorrow be a member of another instead. Something may belong to a class only conditionally. And so forth. Only a *modal* class logic can assimilate such dynamic relations. Science needs this methodological tool, to fully depict the world of flux it faces.

Instant 'state of affairs' pictures are not enough; there is need to specify the avenues and modalities of *transition* (or absence of transition) from one state to another, as well as the causal relations involved. It is not enough to say vaguely what things 'are': we have to specify what they 'must be', what they 'can be', and from what to what and via what, and in which circumstances, they go: only thus can science fulfill its responsibilities.

For this reason, formal logic is obligated to study transitive categoricals and *de-re* conditioning of all types, in great detail. Without such a prolegomenon, many philosophical and scientific controversies will remain alive indefinitely. Right now, there is no formal logic (other than the one here proposed) which *provides a language and neutral standards of judgment* for, say, Darwin's evolutionary theory or Hegel's dialectic of history.

It is just so obvious that someone who is aware of the complexities of dynamic relations, is more likely to construct interesting and coherent theories on whatever subject-matter.

Returning now to modality. You will recall that we distinguished between types of modality and categories of modality, and we

said that a modality is 'fully' specified only when both its type and its category are specified. Upon reflection, now, we can say that even then, the modality is not quite fully specified: to do so, we would still need to pinpoint the exact compound of modality it is an expression of, and indeed, we must do this in both directions of the categorical relations. Furthermore, to complete our description of the relation, we would need to specify the precise *de-re* conditions of its actualization.

Now, just as natural necessity, actuality, and potentiality form a continuum of 'degrees of being', and likewise for temporal modalities — so all the subdivisions of these modalities implied in the previous paragraph clarify the various degrees of being. That is, once we grasp the ontological significance of modality, as we did, then by extrapolation *all the other* formal distinctions, which occur within the types of modality in question, acquire a real dimension (of which we were originally unaware).

Moreover, the very concept of 'degrees of being' can be carried over into the field of extensional modality, in view of the powerful analogies which exist between it and the natural and temporal fields. This is not a mere generalization, because we from the start understood extensional modality as more than mere statistics; it relates to the possibilities inherent in 'universals' as units. Thus, 'Some S are P' and 'All S are P' are different degrees in which S-ness as such may 'be' related to P-ness as such. Thus, the quantifier is not essentially something standing outside the relation, but is ultimately a modification of the copula of being.

Going yet further, the valid *modes* of the syllogism, and indeed all argument, like **nnn** or **npp** for instances — they too may be viewed as informing us of the inherent complexities of modal relations. That 'All S must be P' implies only 'some P can be S' tells us something about being 'in rotation', as it were. That premises **np** yield conclusion **p** (rather than **n** or **a**) tells us something about the causal interactions of these different degrees of being. Likewise, for all types and mixtures of modality. All these so-called processes, therefore, serve to define for us the properties of different types and measures of being, giving us a fuller sense of their connotations.

Which brings us, at last, to the most radical extrapolation of all, and the most relevant to induction theory. Since, as we saw, in principle, logical necessity implies (though it is not implied by) natural necessity, and logical possibility is implied by (though it does not imply) potentiality — we may interpret these *logical* modalities as, in turn, themselves stronger or weaker *degrees of being*. The inference is not as far-fetched as it may at first seem. That something is such that its negation is 'inconceivable' or such as to be itself 'conceivable' is a measure of its belonging in the world as a whole (including the 'mental' aspects thereof).

Between minimal logical possibility (which simply means, you will recall, having at all *appeared* in the way of a phenomenon, with any degree of credibility) and logical necessity (which means that the negation has *not even* a fictional, imaginary place in the world), are any number of different degrees of logical probability. If our extrapolation is accepted, then high and low logical probability are measures of 'being', not merely in a loose epistemological sense, but in a frankly ontological one. This continuum *overlaps with but is not limited to* the continua of being in a natural, temporal or extensional sense.

'Truth', the *de-dicto* sense of 'realization', and 'singular actuality' in the natural/temporal and extensional sense, become one and the same in (concrete or abstract) phenomena. The really here and now is the level of experience of phenomenal appearances (in the most open senses of those terms); we might even say of concrete and abstracts that they are also different degrees of presence, in their own way. Beyond that level of the present in every respect, 'existence' fans out into various ways of stronger and weaker being. Thus, logical probability may be viewed as *in itself informative concerning the object*, and not merely a somehow 'external' characterization of the object.

This suggestion is ultimately made to us by formal logic itself, remember; it is rooted in the concept of impermutability. Thus, the contention by some that Werner Heisenberg's Principle of Uncertainty signifies an objective indeterminism, rather than merely an impossibility to measure — may well have significance. I am myself surprised by this possible conclusion, but suddenly find it no longer unthinkable and shocking: once

one accepts that there are ‘degrees of being’ in a real sense, then anything goes.

Thus, we may also view the mental and the physical, the conceptual and the perceptual, the ‘universal’ and the individual, the ideal and the real, knowledge and fact, and why not even the absolute and the relative — as different types and degrees of being. Being extends into a large variety of intersecting continua. In this way, all the distinct, and seemingly dichotomous, domains of our world-view are reconcilable.

2. Induction from Logical Possibility

Let us now return to the main topic, that of induction, and consider the impact of what has been so far said. We acquainted ourselves with two major processes of induction: adduction and factorial induction.

Adduction concerns theory formation and selection. The logical relation between postulates and predictions, consists of a probabilistic implication of some degree, conditioned by the whole context of available information. The postulates logically imply, with more or less probability (hopefully, lots of it) the predictions; and the latter in turn logically imply with more or less probability (anything from minimal possibility, even to logical necessity) the postulates. The logical relations note well are *mutual*, though to different degrees, and *in flux*, since they depend on a mass of surrounding data.

Thus, the adduced probability, in any given context, of any single proposition, be it frankly theoretical *or seemingly empirical*, is the present result of a large syndrome of forces, which impact on each other too. Theories are formed (appear to us), and are selected (by comparison of their overall-considered probabilities, to those of any modifications or alternative theories), with reference to the totality of our experiences.

Concrete experience, note, is by itself informing, even when it is not understood; abstract theories are also in a sense experiences, to be taken into account. Empirical phenomena determine our theories, and they in turn may affect our particular interpretations of empirical phenomena. There is a symbiotic

give and take between them, which follows from the holistic, organic, nature of their logical relation.

Thus, adduction may be viewed as the way we generally identify *the degree of being of any object, relative to the database present to our consciousness.* Within the domain delimited by our attention, each object has a certain degree of being; and this degree is *objective*, in the sense that from the present perspective the object indeed appears thus and thus. The appearance may not be the central 'essence' of that object, but it is in a real sense a facet of it, a projection of it at level concerned. In that way, we see that *logical probabilities, and logical modality in general, ultimately have a de-re status too*: their way of 'being' may be more remote, but it is still a measure of existence.

Deduction is merely one tool, within the larger arsenal of adductive techniques. Deductive processes are, apart from very rare exceptions of self-evidence (in the formal sense), always contextual, always subject to adductive control in a wider perspective. Modern logicians, so-called Rationalists, who attempt to reduce knowledge to deductive processes, fail to grasp the aspect of holistic probability. Our knowledge is not, and can never be made to be, a static finality; the empirical reality of process must be taken into account for a truly broad-based logic. Likewise, the opposite extreme of Empiricism is untenable, because fails to explain how it allowed *itself* to be formulated in a way that was clearly far from purely empirical terms.

Now, factorial induction is another major tool at our disposal in the overall process of induction. In fact, we may view all induction as essentially adductive, and say that deduction and factorial induction are specific forms or methods of adduction. Essentially, factorial induction is built on the adductive method of listing all the alternative 'explanations' about a 'given datum' — in our case, the given datum is the gross element or compound, and the list of eventual explanations is the factorial formula; that is, the formally exhaustive series of integers compatible with the gross formula, and therefore constituting logically possible outcomes of it.

In the general adductive relation, the hypothetical proposition 'these predictions *probably imply* those postulates (and thus the theory as a whole)', *the terms* of the antecedent categorical need not be the same as *the terms* of the consequent categorical. Thus, the terms of the hypothesis may be *mere constructs*, of broader meaning and application than the more singular, actual and real terms of the allegedly empirical ground. That there are degrees of being, implies not only that there are degrees of truth (as explained, logical modality has a *de-re* status too), but also that there are degrees of *meaning* (again, in the objective sense that something has at least *appeared*).

The terms of a theory may be at first vague, almost meaningless concepts, but gradually solidify, gaining more and more definition, as well as credence. This evolution of meaning and credibility, as we look at the apparent object every which way, may be viewed a change in the degree of 'being'; as long as the apparent object does not dissolve under scrutiny, it carries some weight, some 'reality', however weak. It remains true that any alternative with apparently more weight of credibility and meaning, has a 'fuller' reality, more 'being'. Thus, even though 'truth' is a comparative status, it may still be regarded as an objective rendering of the 'world' of our context.

In contrast, factorial induction deals with generalization and particularization of information. What distinguishes it from adduction (in a generic sense) is *the uniformity of the terms in its processes*. Factorial induction concerns the selection and revision of 'laws'. We generalize 'this S is P' to 'all S must be P' or some less powerful compound (some other integer), *with reference to precise rules*. Here, note well, the terms are the same. This sameness is at least nominal; for it is true that by generalizing the singular actual to a general natural necessity (or whatever), we *modify* the degree of being and meaning of the terms somewhat. This modification is not arbitrary, but is determined by the whole context, including the rules followed.

But anyway, factorial induction is obviously *a case of adduction* (though a special case because of the continuity of terms). That means that the terms themselves may well be more or less theoretical, in the sense of having lower degrees of meaning. Also, the seeming empiricism of their singular actual relation

may or may not be true; that is, it too has degrees of credibility and truth, determined by the overall context. At all levels, from the seemingly empirical, through factorial induction, to the adduction of overt constructs — there is some interactive reference to overall context.

Thus, the rules of factorial induction *remain the same*, however meaningful or true the terms appear at a given stage: they are formal rules, which continue to apply *all along* the development of knowledge. At each stage, they determine a certain answer, or a range of answers, depending on how definite and credible the terms and relations involved appear to us at the time, taking into consideration all available information. The factorial approach to induction is distinguished by its utter formalism, and independence from specific contents.

I want to stress here the profound importance of such an integrated theory of *modal* induction. Through it we see graphically that there is no essential discontinuity between logical (*de-dicto*) modality and the *de-re* modalities. The modality of a thing's being, is the meeting point of all these aspects: on the outer edge, its logical meaning and truth, ranging from logical necessity to extremely dilute conceivability; closer to the center, the *de-re* modalities at play; at the very center, the empirical realization of the essence, towards which we try to tend.

Truth and full definition are approached in a spiral motion, as it were. We can tell that we are closer, but there is always some amount of extrapolation toward some presumed center. Our position at any stage, however composed of theoretical constructs and generalizations, always has some reality, some credibility, some meaning — it just may not be as advanced as that which someone else has encountered or which we will ourselves encounter later. But it is still *a product of* the Object, the whole world of appearances, and as such may well be acknowledged to have some degree of objective being in any case.

Another way to view inductive processes is as follows. Since logical possibility is a subaltern of natural possibility (potential), we can generalize (subject to appropriate rules of corrective

particularization) from logical possibility to natural possibility, just exactly as we generalize (under particularizing restrictions) from, say, natural possibility (potentiality) to temporal possibility (temporariness). This means that adduction in general (that is, even with imaginary terms) is a species of factorial induction.

We have already developed a definitive inductive logic for the *de-re* modalities (with the example of categoricals — *de-re* conditionals can similarly be dealt with, almost entirely by a computer: we know the way). This *de-re* inductive logic can now be extended further to *de-dicto* aspects, simply by introducing *more factors* into our formulas. We saw that the combinations of the natural and extensional types of modality gave rise to 12 plural elements, and thence to 15 factors. When temporal modality is additionally taken into consideration, the result is 20 plural elements and 63 factors. It is easy (though a big job) to extend the analysis further, with reference to the fourth type of modality, namely the logical.

Roughly speaking (I have not worked out all the details), we proceed as follows. Each previously considered element becomes three elements: a logically necessary version (say, prefixed by an **N**), a just-true version (without prefix), and a logically possible version (say, with prefix **P**). These more complex elements are then combined into fractions, and thence into integers; the resulting number of integers is the new maximum number of factors a formula may consist of.

Every gross formula is then given a factorial interpretation, comprising a disjunction of one to all the available factors. The factors must of course be ordered by modal 'strength', to allow for easy application of the law of generalization. Logical necessity or impossibility are 'stronger' than logical contingency coupled with truth or falsehood. *The overall factorial formula for any event is accordingly much longer, but with the factors ordered by 'strength', factor selection or formula revision proceeds in accordance with exactly the same unique law of generalization.*

Thus, our manifesto for modal induction is not limited to the special field of *de-re* categoricals (and eventually *de-re*

conditionals), but is capable of coherently and cohesively encompassing even logical modalities (applied categorically, or eventually hypothetically). We have therefore discovered *the* precise mechanics of *all* adduction. At any stage in knowledge, it should henceforth therefore be possible to characterize any apparent proposition with reference to a precise integer, the strongest allowed by the context.

This refers, not only to simple generalization of 'laws' (observed regularities), but to determining the status as well as scope of any complex 'theory' whatever (however abstract or even constructed be its terms, even if their definitions are still notional and their truths still hypothetical). Of course, the terms still have to be at least minimally intuitively meaningful and credible. But the selection (subject to revision) of the strongest available factor *precisely determines* a proposition (or its negation) as true. There is no appeal to some rough extrapolation on vague grounds, toward the central 'truth'; we now have a formal depiction of the process of pin-pointing the truth at any time.

3. The Novelty of My Work

[With regard to the history of inductive logic,] one thing is clear at the outset: *no one has to date formulated any theory remotely resembling factorial induction.* Adduction is well known — it is the hypothetical-deductive method, attributed to Bacon and Newton; actual induction may, I believe, be attributed to Aristotle (I certainly learned it from his work); but *factorization, factor selection and formula revision* (not to mention the prior logics of transition and of *de-re* modal conditioning) are completely without precedent.

These constitute, I am happy to report, a quantum leap in formal logic. I stress this not to boast, but to draw attention to it. It was the most difficult piece of intellectual problem-solving (it took 2 or 3 months) this logician has been faced with, and the most rewarding. *The problem was finding a systematic way to predict and interpret all consistent compounds of (categorical) modal propositions*; many solutions were unsuccessfully attempted,

until the ideas *of fractions and integers, and of factorial analysis*, presented themselves, thanks God.

The historical absence of a *formal* approach to induction, or *even the idea of searching for* such an approach, is the source of many enduring controversies, as we shall see. Once a formal logic of induction exists, as it now does, many doubts and differences become *passé*. Just as formal deductive logic set standards which precluded certain views from the realm of the seriously debatable, so precisely the formal inductive logic made possible by factorial analysis of modal propositions simply changes the whole ball game.

17. An Inductive Logic Primer

Drawn from Judaic Logic (1995), Chapter 1:2 (part), 2:1-2.

1. Introduction

The reader of the present volume does not need to have previously studied logic in depth to be able to follow the discussion fully, but will still need to grasp certain concepts and terminologies. We will try to fulfill this specific task here, while reminding the reader that the subject is much, much wider than that.

Broadly speaking, we refer to any thought process which tends to convince people as 'logical'. If such process continues to be convincing under perspicacious scrutiny, it is regarded as good logic; otherwise, as bad. More specifically, we consider only 'good' logic as at all logic; 'bad' logic is then simply *il*logical. The loose definition of logic allows us to speak of stupid forms of thought as 'logics' (e.g. 'racist logic'), debasing the term; the stricter definition is more demanding.[5]

Logic, properly speaking, is both an art and a science. As an art, its purpose is the acquisition of knowledge; as a science, it is the validation of knowledge. Many people are quite strong in the art of logic, without being at all acquainted with the science of logic. Some people are rather weak in practice, though well-informed theoretically. In any case, study of the subject is bound to improve one's skills.

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5 We may also speak of 'a logic' in a non-pejorative way, when referring to intelligent forms of thought which are found especially in certain areas of knowledge or scientific fields; e.g. logistics is the logic of willed deployment of (material or mental) objects in space and time, mathematics is the logic of numbers and spatio-temporal relations. Similarly, historians of logic may objectively refer to the logic of (used by or known to) different geographical or cultural groups or periods of history. All specific logics, good or bad, may be subjected to objective study, of course.

Logic is traditionally divided into two - induction and deduction. *Induction* is taken to refer to inference from particular data to general principles (often through the medium of prior generalities); whereas *deduction* is taken to refer to inference from general principles to special applications (or to other generalities). The processes 'from the particular to general' and 'from the general to the particular' are rarely if ever purely one way or the other. Knowledge does not grow linearly, up from raw data, down from generalities, but in a complex interplay of the two; the result at any given time being a thick web of mutual dependencies between the various items of one's knowledge.

Logic theory has succeeded in capturing and expressing in formal terms many of the specific logical processes we use in practice. Once properly validated, these processes, whether inductive or deductive in description, become formally certain. But it must always be kept in mind that, however impeccably these formalities have been adhered to - ***the result obtained is only as reliable as the data on which it is ultimately based***. In a sense, the role of logic is to ponder information and assign it some probability rating between zero and one hundred.

Advanced logic theory has shown that what ultimately distinguishes induction from deduction is simply the number of alternative results offered as possible by given information: if there is a choice, the result is inductive; if there is no choice, the result is deductive. Deductive logic may seem to give more certain results, but only because it conceals its assumptions more; in truth, it is merely passing on probability, its outputs being no more probable than the least probable of its inputs. When inductive logic suggests some idea as the most likely to be true, compared to any other idea, it is not really leaving us with much choice; it is telling us that in the present context of knowledge, we decisively *have to* follow its suggestion. These are the reasons why the word "proof" is often ambiguous; do we mean deductive proof or inductive proof, and does it matter which we mean?

[…]

2. Induction

How do propositions, such as [the categorical or the conditional], come to be known? This is the question inductive logic tries to answer. The way we commonly acquire knowledge of nature, as ordinary individuals or as scientists, is by a gradual progression, involving both ***experience*** or ***perception***, whether of external phenomena (through the sense organs somehow) or of mental phenomena (with what we often call the "mind's eye," whatever that is), and ***reason*** or ***conceptual insight*** (which determines our evaluation and ordering of experience).

At the simplest level, we **observe phenomena**, and take note, say, that: "there are Xs which are Y" (which means, "some X are Y" = **I**), *leaving open at first* the issue of whether these X are representative of all X (so that **A** is true), or just special cases (so that **IO** is true). The particular form **I** is needed by us as a temporary station, to allow us to express where we stand empirically thus far, without having to be more definite than we can truthfully be, without being forced to rush to judgment.

If after thorough examination of the phenomena at hand, a continued scanning of our environment or the performance of appropriate experiments, we *do not find* "Xs which are not Y," we take a leap and presume that "all X are Y" (**A**). This is a **generalization**, an inductive act which upgrades an indefinite particular **I** to a universal of the same polarity **A**, ***until if ever evidence is found to the contrary.*** The *justification* of such a leap is that **A** is *more uniform* with **I** than **O**, and therefore involves less assumption: given **I**, a move to **A** requires no change of polarity, unlike a move to **O**, whereas with regard to quantity, the degree of assumption is the same either way.

If, however, we *do* find "Xs which are not Y" (i.e. that "some X are not Y" = **O**), we simply conclude with a definite contingent **IO**. If the discovery of **O** preceded any assumption of **A**, so well and good, the induction of **IO** proceeded in an orderly fashion. If on the other hand, we had assumed **A**, and then discover **O**, an *inconsistency* has effectively occurred in our belief system, and we are forced to reverse a previously adopted position and effect a **particularization** of **A** back to **I**, to inductively conclude **IO**. Needless to say - and we need not keep pointing out such

parallels between positive and negative polarities - the sequence of such harmonization might equally have been **O** followed by **E**, and then **I** followed by **IO**.

Note that the particulars involved, **I** or **O**, may be arrived at directly, by observation, as suggested above, or, in some cases, indirectly, by deduction from previously induced data. The inductive processes we have so far described, of observation followed by generalization and particularization, are only a beginning. Once a number of propositions have been developed in this way, they serve as premises in deductive operations, whose conclusions may in turn be subjected to deductive scrutiny and additional inductive advances and retreats.

But we are not limited to the pursuit of such "laws" of nature; we have a broader inductive method, known as the process of **adduction**[6].

This consists in ***postulating*** propositions which are not arrived at by mere generalization and particularization, but involve *novel terms*. These novel terms are *put forward by the creative faculty*, as tentative constructs (built out of more easily accessible concepts[7]) which might conceivably serve to explain the generalities and particularities (the "laws") developed more directly out of empirical evidence, and hopefully to make logical ***predictions*** and point the way to yet other empirical phenomena. The imagination, here, is not however given free rein; it is

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6 This is also called the hypothetico-deductive method or the scientific method.

7 A good example of this, is the Newtonian concept of 'force'. At the root of this scientific concept are the notions obtained through our intimate experience of push and pull, speeding and slowing. These intuitions give meaning to the idea of invisible attractions and repulsions between physical bodies, which cause them to accelerate or decelerate as they visibly do. The invisible factor of force is then quantified with reference to measurable changes of velocity. (Positivistic philosophy regards the invisible factor as superfluous; but it is convenient, and we do use it, and furthermore, positivism itself makes use of such abstracts.) The 'novel terms' used in adduction are always based on notions recycled from experience, through the imagination, by analogy, into a new context. What gives the process scientific legitimacy is the check-and-balance provided by adduction.

disciplined by the logical connections its postulates must have with already available data and with data which might eventually arise.

Scientific ***theories*** (complexes of postulates and predictions) differ from wild *speculations* in that (or to the extent that) they are grounded in experience through rational processes. They must deductively encompass accepted laws, and they stand only so long as they retain such a dominant position in relation to newly discovered phenomena. If logical predictions are made which turn out to be empirically true, the postulates are regarded as further ***confirmed*** - that is, their own probability of being true is increased. If, however, any logical predictions are found to be clearly belied by observation, the postulates lose all credibility and must be ***rejected***, or at least somehow modified. Theories always remain subject to such empirical ***testing***, however often confirmed.

Thus, knowledge of nature proceeds by examining existing data, making intelligent hypotheses as to what might underlie the given phenomena, showing that the phenomena at hand are indeed deductively implied by the suggested postulates, and testing our assumptions with reference to further empirical investigations. However, there is one more component to the scientific method, which is often ignored. It is not enough to adduce evidence in support of our pet theory; and the fact that we have not yet found any grounds for rejecting it does not suffice to maintain it....

We must also consider *all conceivable alternative theories*, and if we cannot find grounds for their rejection, we should at least show that our preferred theory has the most credibility. *This comparative and critical process is as important as the constructive aspect of adduction.* To the extent that there are possible challenges to our chosen theory, it is ***undermined*** - that is, its probability of being true is decreased. Evidence adduced in favor of one set of postulates may thus constitute counter-evidence adduced against other hypotheses. We may regard a thesis as inductively "***proved***," only if we have managed to eliminate all its conceivable competitors one by one. Very rarely - though it happens - does a theory at the outset appear unchallenged, the exclusive explanation of available

information, and so immediately "proved," Also note, at the opposite extreme, we are sometimes stumped, unable to suggest any explanation whatsoever.

3. The Art of Knowing

Induction, as an epistemological concept, refers to the logical processes through which all propositions, and their various constituents, are gradually developed. Some philosophers have tended to define induction as the pursuit of general principles from particular ones, but such a formula is too limited and only reflects the greater difficulty of and interest in that specific issue. In the largest sense, induction includes all the following factors of cognition:

- **perception** (direct consciousness of concrete phenomena, whether material/sensory or mental/intimate) and **conception** (direct consciousness of abstract phenomena[8] or indirect consciousness of anything), as well as **recognition** (memory of percepts and concepts) and **imagination** (perceptual or conceptual projection);
- **identification** (awareness of similarities between phenomena) and **differentiation** (awareness of differences between phenomena), which make possible **classification** (grouping), often accompanied by **verbalization** (naming);
- **formulating propositions**, with varying degrees of awareness, sometimes but not always verbally, which relate together various percepts and concepts in various ways (first as possible potential particulars);
- **generalization** and **particularization** (including the techniques of *factorization*, *factor selection*, and *formula revision* - see my work *Future Logic* for details), which are

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8 The process of abstraction consists in ignoring (excluding from consciousness) all but certain aspects of something perceived in whatever way; this process precedes the comparisons, contrasts and mental manipulations through which we conceptualize.

the processes through which one discovers how far one may extend or one must narrow the applicability of propositions;

- **deduction**, the inference of some new proposition(s) from one or more given proposition(s) of any kind, through a host of processes like *opposition*, *eduction*, *syllogism*, *a-fortiori*, *apodosis*, *paradox*, and others;
- **adduction**, the formation and tailoring of postulates, as well as their *testing* and *confirmation* or *elimination*, with reference to rational-empirical considerations (more on this topic below).

All the above depend on reference to the main Laws of Logic, which ensure the ultimate fullness and harmony of knowledge, namely:

1. **Identity** - acknowledging all phenomena cognized, as being at least appearances, and so problemacies with varying credibilities, whether ultimately found to be realities or illusions; *never ignoring data or issues*. (This is what we mean by "facts are facts,")
2. **Non-Contradiction** - not acknowledging as real, but insisting as partly or wholly illusory, any set of propositions cognized as incompatible, whatever their levels of abstraction and cognitive roots; *always pursuing consistency in one's knowledge*. (Contradictions are impossible in reality.)
3. **Exclusion of the Middle** - not rejecting all possible alternatives, but seeking resolution of conflicts, through some new alternative or some commonalty; *seeking solutions to all problems*. (There is no nebulous middle ground between being and not-being.)

Now, these various factors of cognition play a joint role in the acquisition of knowledge, and although here listed in a 'logical' manner, with some subdivisions and in a semblance of chronological order, they in actual practice function very interdependently, feeding off each other's results in every which way and in no set order. Furthermore, they are here described very succinctly, so much so that their individual, relative and collective significances may be missed if one does not take time to reflect.

This brief overview of the theory of knowledge should be understood as *both descriptive and prescriptive*. That is to say, there is no essential difference between the palette of cognitive processes used by different human beings, be they common folk or expert scientists, trained in logic or purely instinctive, male or female, young or old, of whatever class or people, healthy or sick. This must be stressed: everyone has more or less the same cognitive tools; some people are, there is no denying it, better endowed, others somewhat handicapped, but their overall arsenal is roughly the same, as above listed.

What distinguishes individuals is perhaps rather the effort and skill they exercise with these same instruments, in each given context. Knowing is an art, and artists may vary in style and quality. Some people lay more stress on experience, others on reasoning, others on their emotions. Some people are more visual, some more auditory, some more touch-sensitive. Some people are excessively categorical or class-conscious, too verbal in their thinking, to the detriment of intuition; some people are slaves to their passions, exercising insufficient control on the objective quality of their thought processes. And so forth - but in any case, the range of faculties available to human beings is roughly the same. The art, as with music, as with painting, is to find a balance - the right measure, the right time and place, for each instrument.

It must be added that two people equally skilled in the art of knowing (or one person at different times) may arrive at different specific conclusions, due to different ***contexts*** of knowledge. The content and volume of one's experience - in the largest sense of the term experience, including material and mental perceptions and conceptual insights - has a direct influence on one's logic, affecting one's every rational process.

4. Adduction in Western Philosophy

Logic, since Antiquity and throughout the Middle Ages, in Europe at least, has been associated more specifically with deduction, because that was the field in which the most impressive theoretical work had been done, mainly by Aristotle.

Only in recent centuries was a greater stress laid, thanks in large part to practitioners like Newton, on the experiential aspects of knowing (by philosophers like Locke and Hume) and on its adductive aspects (by philosophers like Bacon and Mill); and in more recent times on the crucial role of imagination in theory formation (by Einstein, for instance).

This does not mean to say that induction, nor more specifically adduction, are novel concepts as such. People certainly always used all the factors of induction in their everyday efforts at knowing - they used their senses and their heads, to try and make sense of the world around them, sometimes more wildly than we do, sometimes more rigidly, sometimes more sensibly perhaps. Also, we have to admit that Aristotle, after some four or five centuries of development in Greek philosophy including his predecessors Socrates and Plato, was well aware of the primary issue of induction, the so-called 'problem of universals' (namely, how concepts are known).

Indeed, his formal work in logic, including on opposition, on immediate inference and on the syllogism, was a lucid attempt, however incomplete, to solve just that problem. Deduction, in Aristotle's view, was not apart from induction, or against it, but rather a major aspect of induction. For him, it seems, certain generalities were known directly and indubitably (like the axioms of logic), others had to be developed empirically (seemingly, by complete enumeration); thereafter, one could arrive by inference to all other general principles. The grey areas in that view were, no doubt, the source and validity, and the number, of the initially given top principles, as well as the scope of empiricism in the light of the practical difficulties in complete enumeration.

Today, we would certainly agree that deduction is one of the instruments of induction - needed to infer predictions from postulates for testing purposes, and more broadly, to pursue consistency. The grounds of knowledge, in our view, are primarily experiential data, whether concrete or abstract, and to a lesser extent self-evident propositions whose contradictories are self-contradictory. We are more aware of the hypothetical and tentative nature of much of knowledge; and instead of

complete enumeration, we refer to processes like generalization and particularization.

But if we regard the perceptual and conceptual phenomena which are the starting-points of knowledge as being effectively 'axioms' (in an enlarged sense of the term), then our view is seen as not much different from Aristotle's in essence, though varying in detail and emphasis. The historical point I am trying to make is certainly not, that Aristotle was omniscient and as fully aware of epistemological questions and answers as we are today. Rather, that in his time and earlier still, a search for such questions and answers was already in motion, and a spirit of intelligence, honesty and objectivity was already at work, so that to make a fair assessment we must focus on his contributions instead of his blanks.

I think it is important for historians to keep in mind that philosophers are human. They do not have time to put everything they know or think into words, down on paper. Often, too, they intuit a larger horizon than they have the time to actually tread in detailed thought. No one philosopher can therefore be expected to point out and clarify every aspect of induction, or to develop a truly full spectrum of logical techniques. Not saying something is not necessarily not knowing it, or at least being on the way to know it. Some unimaginative disciples, as well as historians, tend to ossify philosophies, and make them seem more rigid and limited than they were to their living wellsprings.

Thus, the suggestion that general propositions are arrived at by 'complete enumeration', attributed by some historians to Aristotle, contains within it the seeds of empiricism. We today certainly acknowledge the major role played by *partial* enumeration - this is how *particular* propositions are known: one experiences one or more cases of a kind to have a certain attribute or behavior, and one expresses that observation verbally, without thereby presuming to comment on the unobserved cases or to claim that they have the same attribute or behavior.

This is the common ground, between us and Aristotle; the issue is only, how one moves up from there to generalities. Complete enumeration may have been, for Western philosophy, a first and

tentative suggestion; but upon reflection it was soon enough seen to be an impractical ideal, because most classes we deal with are open-ended. Today, we realize that the answer is to be found in the trial and error processes of generalization and particularization, or more broadly speaking in adduction.

Nevertheless, in spite of their manifest deep roots in the past, it is evident that until the Enlightenment the concept and laws of adduction were relatively little discussed and little understood, in Western philosophy at least. Historians tend to attribute to Francis Bacon (1561-1626, London) the clear formulation of these laws. As Anthony Quinton points out, the crucial innovation in Bacon's 'new method' was that it was *eliminative* ("*major est vis instantiae negativae*"[9]). Bacon also gave due credit to the positive aspects of induction (i.e. observation and confirmation), and he made explicit many of the pitfalls possible in the course of such processes (which he referred to as "idols").

Needless to say, Bacon's words were not the last on the subject; many further contributions have happily been made since then. Whatever their precise history, the **Laws of Adduction** may be expressed as done below. By 'postulate' is meant a set of imagined propositions of yet unsettled truth. By 'experience' is meant any appearance, preferably concrete rather than abstract, taken *as is*, as it appears, as a mere configuration of phenomena, without classificatory work of comparison and contrast to other, remembered phenomena. By 'confirmation' or 'weakening' of a thesis is meant adding or subtracting some credibility from it; whereas by 'proof' or 'disproof' is meant extreme credibility or incredibility.

1. **If some postulate has certain necessary logical implications, and these implications are found to be in accord with experience, the postulate is thus far confirmed, though not necessarily proved** (Positive Law).

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9 This statement can be found in Bacon's *Novum Organum*, Book I, aphorism 46. The whole book is available online at: https://www.gutenberg.org/files/45988/45988-h/45988-h.htm.

2. **If some postulate has certain necessary logical implications, and these implications are found to be in discord with experience, the postulate is disproved, and not merely weakened** (Negative Law).

These laws may be explained, and unified, with reference to the concept of probability, and on the same basis many corollaries can be derived from them. The corollaries emerge from the consideration of competing postulates - a couple of examples: every time a postulate is confirmed, while a competitor is not confirmed, then the latter is weakened; when a postulate is disproved, then all its remaining competitors (whether known or unknown alternatives) are strengthened (though all equally so, unless some of them predicted the disproving experience, rather than merely accepted it). However, these issues and details are too voluminous for the present study (see my work *Future Logic*).

18. INTRO TO PHENOMENOLOGY

Drawn from Phenomenology (2003), Chapter 1.

1. What, Why and How

Phenomenology may be defined as the study of appearances as such. By an 'appearance' is meant any existent which impinges on consciousness, anything cognized, irrespective of any judgment as to whether it be 'real' or 'illusory'. The evaluation of a particular appearance (an existent within the field of consciousness) as an illusion (existing *only in* consciousness) or a reality (existing *not merely in* consciousness, but also before it, after it, without it or beyond its range) is a complex process, involving inductive and deductive logical principles and activities. Opinion has to earn the status of strict knowledge. To begin with, appearance must be taken neutrally, at face value, as the common ground of reality and illusion (i.e. one of a triad).

An appearance *is* whatever it *seems to be*. At this level of consideration, the verbs 'to seem' and 'to be' are one and the same. It is only at the next level, where an assessment of status is involved, that they have to be separated.

Since appearing is being known, phenomenology can be regarded as a branch of both Ontology (the study of being as such; or more restrictively, of real being) and Epistemology (the study of knowledge as such; or more restrictively, of true knowledge). Phenomenology differs from ontology in being less presumptive as to the nature or status of the object dealt with, and it is for this reason a study essential to epistemology. The basic insight or premise of phenomenology is that knowledge develops from neutral appearance. The common-sense view of knowledge would seem to be that knowledge develops from data considered *at the outset* as 'sensory', but as we shall see this view involves logical difficulties. The phenomenological approach is an attempt to overcome these difficulties, and propose a more coherent order of development.

As I have shown in my work *Future Logic*, no item of apparent knowledge, not even a percept, is ever immediately and definitively 'true' all by itself. An item may initially *seem* to be true, or contain some truth; but it is only in relation to all other items, which likewise *seem* to be true, that the judgment as to whether it is *really* or entirely true can be made. Even the various criteria and tests involved in such terminal judgments are themselves to start with merely seemingly true. The science of phenomenology is built on the same basic insight.

In this volume, we shall understand the term 'appearance' very broadly as including: a) objects of perception, i.e. concrete phenomena in the physical or mental domains; (b) objects of intuition, i.e. one's subjective self, cognitions, volitions and valuations (non-phenomenal concretes); and/or (c) objects of conception, i.e. simple or complex abstracts of preceding appearances. Abstraction relies on apprehensions of sameness and difference between appearances (including received or projected appearances, and projected negations of appearances). Abstracts are firstly simply summaries of information; and at a later stage, more complex hypothetical entities. Coherence in knowledge (perceptual, intuitive and conceptual) is maintained by apprehensions of compatibility or incompatibility.

With regard to terminology, the reader is advised to keep in mind that in philosophy, and in this particular philosophical treatise, we use words somewhat differently or more specifically than in common parlance. Contrary to the impression given by the term 'phenomenology', it should be understood as a study not merely of 'phenomena', but of all appearances, including intuited particulars and abstract data[10]. The word 'appearance' is often confused with 'illusion', but here includes 'reality'. It is about equivalent in scope to the term 'object' (content of

10 There is no point in coining a new term, even though the term phenomenon is in the present volume used in its primary sense of material or mental concrete particular, in contradistinction to intuited objects or abstracts. But note that in practice the term is often used more loosely with reference to complex appearances like 'a social phenomenon' – which include not only concretes, but also intuitive experiences and even abstracts.

consciousness) or ‘thing’ in logic (anything existing or thought of). Note well that here ‘experiences’ refers not only to the phenomena of physical perception, but includes mental percepts, and even intuited data. In common parlance, the term can be more restrictive (limited to sensory inputs) or even coextensive with ‘appearances’ (e.g. ‘my life experiences’ includes my abstract thoughts). And so forth – all terms will be made clear in due course.

Phenomenology is a science based primarily on attentive detailed observation of one’s own experience and discursive behavior, and only secondarily on careful logical analysis and ordering of such observations.

Thus, practice of *meditation* is a prerequisite to development of this philosophical discipline, and our success in the latter depends on our skills in the former. Although philosophical awareness and thinking are ultimately obstacles to meditation (which rises above intellectual pursuits), the former can in the interim still draw significant lessons from the latter. Labeling phenomena as “phenomena,” or making distinctions between them, or distinguishing them from intuitive experiences or from abstractions – such acts are all non-meditative; but they may well occur and be remembered in the course of meditation.

2. Knowledge is Based on Appearance

Our primary consideration ought to be just what is apparent to our awareness at each and every moment. Nothing can be granted offhand except this first given.

Appearance is immediately granted – because there is nothing else to discuss or refer to, because discourse arises solely in reaction and in relation to it.

Thereafter, we may stage by stage show how knowledge in general, including our alleged knowledge of those stages, develops.

The core thesis of phenomenology, thus, is that *knowledge is based on appearance*. This is in stark contrast to other approaches to epistemology, which propose that knowledge is based on ‘external reality’ or on ‘subjective truth’ or some such

premature thesis. Moreover, phenomenology regards as essential that *the sequence in which knowledge arises and develops out of appearance* be clarified. A notion or suggestion may be appropriate if intelligently placed in the 'order of things', but very misleading if misplaced.

Consider, for instance, **Naïve Realism** (or Materialism or Objectivism)[11]. This philosophy proposes that we have a body with sense-organs, that when these come in contact with external objects sensations are produced, which in turn produce primary ideas (images) in the mind, which are what we experience and build more complex ideas (abstract concepts) from. At first glance, this thesis may appear obvious and worthy of universal belief. But upon reflection, we see that it leads to serious logical problems. If, as it suggests, ideas 'represent' external reality, how do we know that they indeed 'correspond' to it? If, as this theory implies, all we know are ideas (sense-data and their combinations), *how can we even get to know that there is an external reality at all, let alone a body with sense organs in which our minds reside?* Thus, surprisingly enough, this approach to knowledge is internally inconsistent.

In reaction to this conundrum, some philosophers have opted for the opposite extreme, a **Mentalism** (or Idealism or Subjectivism)[12]. They have, in fact, accepted the core tenet of Naïve Realism that what we perceive and build knowledge on are mental substances called ideas, while simply dropping its thesis that these ideas originate in physical sensations in response to stimuli from external objects. The trouble with this thesis is that it involves a stolen concept, since it would be hard put to define mentality after having done away with that of

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11 Historically, at least in its modern version in the West, we owe this philosophy to John Locke (English, 1632-1704). The difficulties inherent in it were noticed implicitly by his predecessor René Descartes (French, 1596-1650), and later by the likes of David Hume (Scottish, 1711-76) and Immanuel Kant (German, 1724-1804). Notwithstanding, Naïve Realism has remained a basic belief, and a source of considerable confusion, for many people, including philosophers and scientists.

12 For example, the Yogachara school of Buddhist philosophy.

materiality. Moreover, it does not really *explain* the mass of data at hand – it merely explains it *away* as illusory happenstance. It does not elucidate why there would appear to be an enormous universe of matter 15 billion years old, composed of innumerable galaxies, stars, atoms, quarks, including on a small planet called Earth apparent human beings, with apparent bodies, with apparent sense organs. Mentalism just ignores all this, or discards it as sheer fantasy; it does not make it comprehensible. It is therefore incomplete.

Having grasped the problem inherent in the former theory, we might be tempted to opt for the latter, however imperfect, were it not for the possibility of another approach, that of **Phenomenology**, which presents neither the flaw of internal inconsistency nor that of incompleteness. Phenomenology brings together the best in both those theories, while weeding out their faulty elements.

Phenomenology starts like Mentalism with the *given content of consciousness*, but identifies that content neutrally as 'appearance', instead of taking up the prejudice that it is something mental (idea). For it must be realized that the concept of mind was built in contrast to that of matter; it has no meaning by itself, and would not have arisen were it not for the concept of matter. Phenomenology therefore posits a concept of appearance, which leaves the question of mind or matter open to begin with, a question to be answered in a larger context.

Phenomenology ends like Naïve Realism with a belief in matter as well as mind, but it does not get to that thesis in the same manner. The error of Naïve Realism is not essentially its notion of a physical body having sensations that generate ideas, but the fact that it takes this notion for *immediately granted*, treating it effectively as a mere observation. Phenomenology avoids this error by understanding the notion in question as a *hypothetical model*, through which we manage to *organize* appearances into an orderly and consistent whole called knowledge.

Our premise is that the starting point of epistemology is never a blank mind in a social vacuum, but the belief framework of ordinary persons in a given historical and geographical cultural context. Researchers in epistemology are *themselves* such

ordinary persons in a given societal climate, with their particular viewpoints, though hopefully outstanding intellectual capacities. Any theory such researchers propose must ultimately convincingly explain the genesis of the ordinary frameworks. Whether the latter are thus wholly justified, or demonstrated to be aberrant to some extent, they can neither be ignored nor entirely rejected without logical absurdity.

It is worth making a comment here, parenthetically, about the cultural context. A man like me, born in the 20th Century and educated in the West, normally takes the Realist viewpoint for granted, and assumes that everyone else in the world naturally does too. People with an opposite perspective seem at first unnatural (philosophical nitpickers or weirdo mystics), if not nonexistent. But it must be kept in mind that in other regions of the world and in other periods of history, there have been humans who sincerely held very different worldviews (consider animism or shamanism, for instances). One should remain open minded.

3. To Be or Not to Be

One notable radical difference with ordinary thinking in our place and time is the Buddhist notion that we have no self. The Buddhist outlook stems from the position of Indian philosophy that all that we can cognize are *dharmas*, that is (in a primary sense) concrete phenomena of perception, and eventually (in an enlarged sense) the abstract derivatives thereof. The ‘reality’ of dharmas was considered ‘illusory’, since they were impermanent, without abiding characters; and all the more so, derivative notions about dharmas. The Hindu branch of Indian philosophy opted for the thesis that beyond such elusive existents there is a (more ‘real’ and ‘permanent’) spiritual existence (with individual selves or souls, and a universal Self or God). Buddhist philosophy, on the other hand, forked off, denying any such additional existents (on the surface, at least, because they later admit a ground of being, which is known only on the highest level of consciousness). Moreover, some Buddhist schools effectively consider some dharmas as material, whereas others consider all as mental.

Some modern Western thinkers would agree with the no-self position, from a more mechanistic perspective, regarding man as a machine (an organic computer or robot) devoid of soul. René Descartes (17th Century) was the first in the history of Western philosophy to raise the issue of selfhood (or raise it so explicitly and clearly). He inferred (*ergo*) existence of self (*sum*) from existence of cognition (*cogito*). More precise would be to say that we (at least partly) infer Subject and consciousness from the appearance of Object. Something appears – *to what (whom)?* a Subject! *how?* through consciousness! Some philosophers would consider such reasoning as compulsive, influenced by mere grammatical habit. But in my view, these characterizations are neither just habitual nor deductive certainties; they are inductive *hypotheses*[13] needed to settle certain logical issues.

The term 'Subject', by the way, is used as here relative to 'Object', in the relation called 'consciousness'[14]. In the relation of 'volition', the same entity is called 'Agent', versus the 'will' (the act of will or that which is willed). The term 'soul' refers to the common ground of Subject and Agent (as well as affective and other roles). The term 'self' stresses the personality of soul, as distinct from other entities, which lack consciousness, volition and affection. The term 'spirit' stresses the distinct substance of soul, compared to material or mental entities (without at the outset excluding that all three may ultimately be of uniform stuff).

In my view, the issue of self is relatively secondary in importance, in the (re)construction of knowledge from scratch that Descartes was pursuing here. He quite correctly saw that even apparently sensed objects may be dreamed. But he (so far as I know) missed the primary conclusion that 'whether these appearances are reality or illusion, it is at least sure that they are'. *That* ought to have been his main building block. In that case, the second inference becomes 'something appears to be (thus,

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13 Hypotheses, incidentally, made by the Subject through consciousness.

14 I use capitals for the 'Subject', and occasionally the 'Object', of consciousness, to avoid confusion with the subject or object of a proposition, and other ambiguities.

exists), therefore I and my consciousness of that appearance also exist', the reverse! But I am perhaps being picky. His '[I][15] think therefore I am' can also in fairness be read as '***things appear therefore I am here seeing them***'. Note also that the 'therefore' implies someone inferring; thus, not only experience but also reason are implicit in the insight and statement.

In the present volume, we shall radically diverge from the Buddhist or Western Mechanist theses. It is indeed logical to suppose that if all we can cognize are the concrete physical and imaginary phenomena we perceive, i.e. *visual, auditory, tactile, olfactory or gustatory* manifestations of being, and the abstract ideas we form in relation to those phenomena, then there is no self. For no one can claim to see or hear or touch or smell or taste the self – it has admittedly no *perceptible* qualities. However, the way out of this dilemma is to abandon the underlying dogma (about dharmas), and admit that we have another sort of cognitive relation with the self and its exclusive properties (consciousness, will and valuation) – a direct self-experience that might be called 'intuition'.

This thesis need only be taken as a hypothesis to start with. But it soon, as we shall see, becomes evident that such self-experience is needed and extremely useful in solving a variety of epistemological as well as ontological problems. For examples, how are present memories (of past sensations) distinguished from present sensations? Or how are word intentions known to be intended? Thus, it is not through some arbitrary superstition that self and its functions are established, but through the utility and gradual confirmation of the hypothesis of intuition. Theories of knowledge that ignore or exclude intuition merely seem to manage to stand without it,

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15 I put the 'I' implied in 'cogito' in brackets, so as to stress the verb 'think' as primarily implied. The 'I' is grammatically required at the beginning of that sentence, but logically is intended as given in the 'sum' clause, only after an inference indicated by the 'ergo' conjunction. This remark justifies my reformulation of Descartes statement as "think (thoughts appear), therefore am (they appear to someone, call that me),"

because they do not explicitly confront certain issues, leaving them tacit and unresolved.

4. The Phenomenological Approach

Phenomenology, then, is a theory of knowledge that (a) lays emphasis on a neutral, noncommittal consideration of the building blocks of knowledge as 'appearances' – meaning all contents of consciousness, without prejudice as to their source or nature – and (b) seeks out *organizing concepts and principles* that would successfully order this knowledge if proposed in an *appropriate sequence*. We may well propose elements of Realism or Mentalism, provided we do so in a critical manner.

The *basic building blocks* of knowledge include concrete experiences, meaning perceived material and mental phenomena and intuitions relating to self, and the conceived, abstract derivatives of the preceding. How to we proceed from experiences to conceptual knowledge? Among the *prime processes* involved are apprehensions of sameness or difference (comparison and contrast) and of compatibility or incompatibility (confrontation, face-off). These processes make use of a certain amount of imagination, which however does not detract from their impartiality, as we shall try to show. The intent here is to sketch *a phenomenological approach* to such fundamentals of epistemology. That is, we need to depict hypotheses as to how the abstract derives from the phenomenal and intuitive, without any prior assumptions as to the nature of the phenomenal, intuitive or abstract, in a manner that considers appearances *ad hoc*.

Attempts to do this under a Naïve Realist presumption have little credibility in that they assume as given that the observer (me, you) has a 'physical' body, sense organs and a brain, whereas (upon reflection, more critically) these entities and their material substance can only in fact be justified *after* a long analysis and synthesis of all data. The alternative, phenomenological approach avoids this logical difficulty (circularity), by starting without assumptions concerning the nature of phenomena or their status (whether they are real or illusory), and proceeding in

an ordered manner from the experiential level to the conceptual level, with reference to convincing cognitive processes. If we thereby arrive at a conclusion justifying the basic assumptions of the naïve view, so well and good; but we do not base our understanding on that view. It is an effect, not a cause of knowledge.

What matters for us here in phenomenology, to begin with, is *what* is cognized, irrespective of *how* it came to be cognized. Because the 'how' is ultimately just another 'what'. For instance, the common thesis that the visual phenomena appearing before me here and now are the end products of a process of some kind involving physical eyes, constitute in this context an *attempt at explanation*. Taken as a given *ab initio*, it constitutes Naïve Realism. But to say this does not exclude the truth of the thesis as a *final* conclusion.

Note that we say 'naïve', not so as to intimidate eventual dissenters into following suit, but because there is an unquestioning acceptance, an unawareness of the issues involved, to correct. In our example, the main issue is (simply put) that, just as each act of seeing something requires validation, so the vision of the eyes themselves is itself open to doubt. It is not because our perceptions are occasionally wrong that they need evaluation, but because a lot of what we regard as perceptual is more precisely (at least in part) conceptual.

Phenomenology is the *intelligent* organization of appearances into knowledge. By 'knowledge' is meant loosely, to start with, our opinions and impressions. If these are well organized, they gain the status of knowledge in a strict sense, or 'true' knowledge. If they remain scattered and confused, they are classed as mere opinions and impressions, or 'false' knowledge. Among the basic methodological principles of phenomenology, we may cite the following:

Attention to all appearances in all their details. Awareness that they change and accumulate.

Constructing a theoretical model that takes all appearances into consideration, and does not simply ignore them nor (worse still) contradict them.

The order of things in knowledge proposed by that model must be coherent, as an inappropriate sequence of events can hide or lead to contradictions.

Such an epistemological model is necessarily flexible, open to revision, depending on its adaptation to the current mass of data and insights.

It is not an axiom, but is acknowledged to be an ongoing hypothetical construct, to be ‘proved’ inductively by virtue of its adherence to the aforesaid reasonable principles (which may of course be viewed as themselves part of the construct).

Many historical philosophical errors have been caused by a failure to consider the order of things in the arising and development of knowledge. This is equally true in matters of detail, as in grand issues.

For example, the Zeno paradoxes cannot be conceived as proofs that motion is impossible, but only as evidence that our (or Zeno’s) initial *concepts* of motion are problematic; for motion is *experientially* manifest before and irrespective of any conceptual deliberation concerning it and all discussion concerning motion arises only in reaction to such experience of it as an attempt to rationally interpret and explicate it.

One of the main purposes of the present essay shall, therefore, be to identify the temporal and logical order of the main items in knowledge, so as to pre-empt such errors.

19. ORGANIZING PRINCIPLES

Drawn from Phenomenology (2003), Chapter 2:1-3.

1. The Order of Things

Philosophy cannot answer its basic questions any old how; it must proceed in stages, in such a way that its own assertions and implicit assumptions are equally addressed. If a philosopher does not take account of *the order of things* in his mind or knowledge, he is bound to develop erroneous views. To assess such order, one must trace the complex genesis of important concepts.

Basic concepts like 'appearance', 'existence', 'reality', 'illusion', 'experience' and many, many more, are of course well-nigh *impossible to define* in verbal terms. The reason is obvious: definition has to stop somewhere; it cannot go on ad infinitum. Such concepts can at best be partly indicated, by pointing to experiences, partly communicated by negation. They are *nonetheless generally understood*, if only after some verbal clarifications.

One of the principal tasks of philosophy is to ***identify the main organizing concepts or principles***, through which all the information given us in appearance can be summarized, ordered and understood. Some of these subdivide the world of appearance into smaller, variously interactive domains and classes. Others are concepts of number, which make measurement of these various elements of appearance feasible, in the realms of space and time, or in statistical contexts like modality and causation, or in other, more specific issues.

In this context, it would be necessary to hypothesize ***how the distinction arises phenomenologically***. That is to say, are there phenomenal *marks or events* that promote and justify such distinction? For example, is matter simply more vividly manifest than mind, or otherwise evidently qualitatively different, or do we make the distinction with reference to intuitions of our own

inner actions, such as looking in the direction of the senses versus looking in the direction of memory or of one's own intentions. As we shall see, my conclusion in many contexts is that phenomenal marks or events are not sufficient differentia, and we must refer to self-experience to explain certain primordial distinctions.

If we proceeded according to the natural or logical 'order of things', our account of the foundations and development of knowledge would begin with meditation on and discussion of **present Appearance**, by which I mean the totality of appearance, in a given moment or cumulatively over time. Then we would dissect such totality into its **constituent appearances**, in an appropriate order, and investigate the various reasons and ways such distinctions arise, as well as the measurements involved in making them. This is of course an enormous task, and I do not propose to fulfill it exhaustively in the present volume but merely to begin it and thus illustrate it.

The topics treated in this work cannot be presented in such strictly orderly fashion without losing the reader's interest. Some segments will grab the reader's attention, others may seem tedious; so, the writer must gauge what to put where. The important thing is to try and make clear within the text what the correct ordering of information would be. Some topics will barely be mentioned, because they have been or will be dealt with in considerable detail in other works of mine, and I see no point in repeating myself. Nevertheless, some repetition is inevitable, if only in the way of summary, if my discourse is to be understood.

The following are some of the most important *organizing concepts or principles*, which we shall try to elucidate to some extent in the coming pages. This catalog is not intended as exhaustive or systematic, but rather as suggestive and associative.

a) Large concepts:

- Distinction between appearance, existence and reality (and their respective negations); ontology.
- Discerning object, consciousness and subject; epistemology.

b) Analytic concepts:

- Distinction between phenomena (material or mental), intuitive (self and its immediate functions), abstract (concepts about phenomena, intuitives and/or abstracts); comparison, confrontation, verbalization, classification; inductive and deductive logic.
- Distinction between matter, mind and spirit.

  Matter: surrounding world (atoms and molecules, quarks and stars, fields) and own body (sense and motor organs, brain); physics, physiology.

  Mind: memories, imaginations, anticipations, mental feelings; psychology.

  Spirit: self/other; soul, cognition, volition, valuation; psychology, ethics.

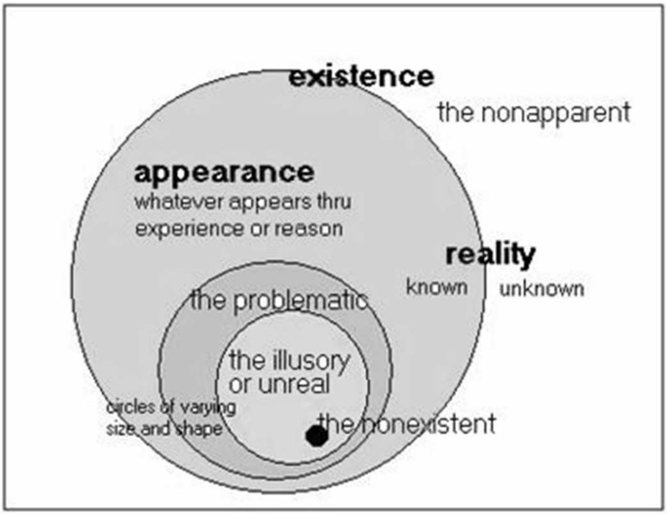
c) Concepts of mathematical relation (measurement):

- Discerning number (unit, plurality, proportion); arithmetic (algebra).
- Discerning time (present, past and future), space (distances; adjacent, apart; inner, outer), motion and change (all of which, in matter or mind); chronology, geometry.
- Discerning modality (necessary, actual, potential, and their negations) and causality (spontaneity, causation, volition, influence), in all their modes; statistics, tropology, aetiology.

2. Appearance and Other Large Concepts

By ‘**appearance**’ is meant, first of all, anything and everything – but upon reflection, more specifically anything which ‘comes to mind’, by whatever means. This is not a definition, but an indication. The term appearance is too fundamental to be definable without circularity, we can only ‘point to’ its instances; indeed, whatever we can point to, in any sense of the term (physically with a finger, mentally by projecting a boundary, verbally by defining or intentionally by focusing on), is an appearance. Thus, ‘appearance’ refers to any object – of consciousness (but of course, ‘consciousness’ is itself too basic to be definable – see further on).

Diagram 19.1 Existence, appearance, and reality.



The concept of appearance differs from that of '**existence**' as of when we assume that *things exist before or after we are aware of them*, and therefore by extrapolation that *things exist that we are never aware of*. This assumption that there are things (existents) we are not conscious of, serves to explain or integrate, among others, the appearance that *things disappear and reappear* (signifying continuity of existence in the interim – granting reliability to memory). It also expresses our belief that *other* selves beside oneself exist (as opposed to solipsism), each of which is aware of (and reports) some things one is not aware of, or unaware of some things one is aware of.

Thus, although the two concepts may initially coincide, at some stage we come to regard *appearance as a subcategory of existence*, implying that whereas all appearances exist, some existents are *not* apparent. Non-apparent existents are, note well, hypothetical; i.e. 'nonappearance' is a word whose content is by definition unknown but not in principle unknowable. Non-existents do not, of course, exist; which means that the word 'nonexistence' has no ideational content, but is just a *verbal*

construct by negation (an artifice we use as a sort of garbage can for incoherent hypothetical concepts or propositions).

We may here also mention, in passing, the subsidiary concept of *actuality*, or 'present existence', which arises in the specific context of natural modality, to distinguish between potentiality *with* present existence and that *without* present existence.

The concept of appearance likewise to begin with coincides with that of '**reality**'. But as of when we come to the conclusion, as a way to explain certain illogical appearances (like contradictions between experiences or between our beliefs/predictions and experiences) that *some things are illusory*, i.e. that consciousness *errs* occasionally, we posit that *reality is a mere subcategory of appearance, and therefore of existence*. The complementary subcategory of appearance, unreality or '**illusion**', also has the status of existence, note well. There are also appearances that we are at a given time unable to classify as reality or illusion; these are temporarily *problematic*.

One cannot claim that *all* appearance is illusion, without thereby contradicting oneself, since such a claim is itself an appearance that is being assumed a reality; it is therefore logically self-evident that *some appearances are realities*.

The *deductive* relation between these concepts is therefore this: appearance is the common ground of reality and illusion, i.e. *implied by both but not implying either*. Reality and illusion are mutually contradictory concepts – both cannot be true/applicable, but one of them must ultimately be so. Thus, every object of awareness can be claimed as appearance offhand, without prejudicing the issue as to whether it is real or illusory.

However, appearance and reality are also *inductively* related, as follows: ***every appearance may be assumed a reality unless (or until, if ever) it is judged (for logical reasons, as mentioned) to be an illusion.*** Just as the concepts of appearance and reality are initially (at an uncritical, naïve level) the same, so in every instance they remain equal except where illusion is demonstrated (or at least, doubt is instilled). This principle, indeed, underlies and justifies all inductions.

Note well that the above differentiations between existence, appearance and reality are not immediately obvious, neither in

the development of an individual's knowledge nor in the history of human thought. They are not *a priori* givens, or self-evident deductive certainties or axiomatic absolute truths, but conclusions of rational (conceptual and logical) process. That is, they express a set of hypotheses which *inductively*, over time, have been found to satisfactorily integrate and explain a mass of appearances, i.e. to fit-in in a comprehensive and convincing world-view. Thus, to mention these differentiations *ab initio*, as we do here, may be misleading – they are only at this stage vague notions and assumptions, which are in the long run further defined and found confirmed by the absence of any equally credible hypotheses, any other conceptual constructs which prove as coherent and consistent both internally (as theoretical postulates) and externally (in relation to cumulative appearance, and especially experience). Their being hypotheses does not per se invalidate them, for the claim that all hypothesizing is invalid is itself equally hypothetical and so self-invalidating.

We shall again anticipate, with reference to what we mean by '**consciousness**' or 'awareness' or 'cognition'. This may be defined as *the relation* between Subject and Object, whatever activities or states either may undergo within such relation[16]. The fundamental given is appearances – but we have no reason to believe that all appearances appear to each other, i.e. we seem to have a privilege among existents in being aware of other existents. We suppose thereby that the fact of 'appearance' is different from mere 'existence', and occurs *only* relative to a conscious Subject.

The '**Subject**' of this relation is identified with the intuited self (me, in my case – you, in yours), but such intuition has at first only the status of an appearance; it is initially a vague and uncertain notion rather than a fully developed and justified concept. The other pole in the putative relation of consciousness, the '**Object**', refers to the appearances involved (which are here

16 Whereas 'consciousness' refers to the relation, 'cognition' is conceived rather as an 'act', and 'awareness' as a state – but for our purposes we shall regard them as equivalent terms. The point is that the essence is relational, irrespective of activities or states that may often attend it.

given another name to stress their being taken into consideration specifically within the said relation).

To posit such a relation does not tell us anything much about it, admittedly – we merely have a word for it, referring to something supposedly too primary in knowledge to be definable. But the trilogy Subject-consciousness-Object is posited by us in a bid to understand and explain how and why appearance differs from existence. The meaning and validity of this hypothesis, including the new ideas of a Subject and consciousness, are not immediate, but established with reference to the cumulative thrust of experience and reasoning, including consideration of conflicting hypotheses. It is only after the latter are found less coherent and consistent than the former that we inductively conclude that our hypothesis is convincing and reliable.

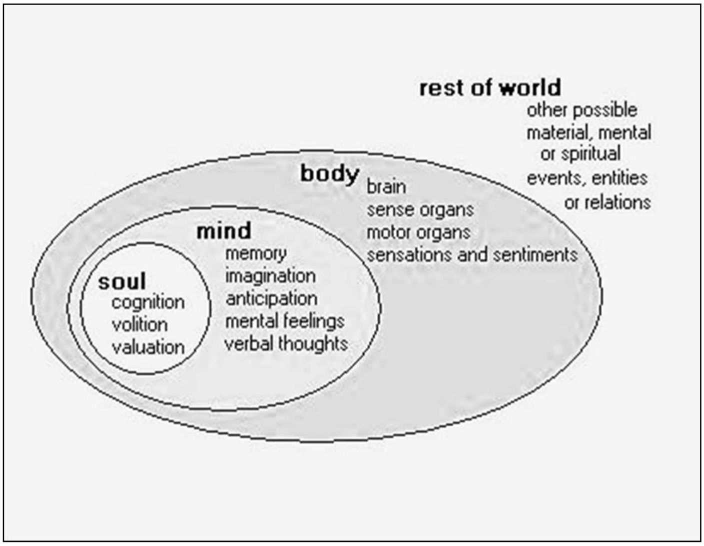
Let me emphasize preemptively that to postulate that ***appearance signifies existence within awareness*** is not meant to imply that the existence of appearances is *caused by* awareness, but only to *differentiate* putative non-apparent existents from appearances. The relation of consciousness is postulated as per se neutral, affecting neither the Subject nor the Object. Existents remain essentially unchanged by it when they enter the field of awareness and are labeled more specifically as 'appearances'. To presume the contents of consciousness 'subjective' (in the pejorative sense of the term), implying a dependence (creation or modification) of the Object by the Subject, is a very different hypothesis; one, indeed, hard to uphold, since if we apply it to itself we put it in doubt. Moreover, if such subjectivist hypothesis were claimed true, there would be no need for it, for 'appearance' and 'existence' would be coextensive. So, our hypothesis of consciousness is inherently rather 'objectivist'. Evidently, there is lots of reasoning behind such concepts and postulates; they are not arbitrary assertions (as some philosophers contend). Also, such reflections and clarifications are not and need not be consciously made before at all embarking on the enterprise of knowledge; they flower gradually in response to specific doubts and questions.

3. Material, Mental, Intuitive, Abstract

Now, of all appearances, those labeled '**phenomena**' are the most manifest, the most evidently present to our consciousness. They are so called to stress that we should not immediately take for granted their apparent reality, having over time become aware that some are best judged illusory after due consideration. Phenomenal objects seem more directly or immediately knowable than others – apart from the issue of reality or illusion just mentioned – so we assign them a special kind of consciousness or cognition called perception and label them 'percepts'.

Among phenomena, some are more ostentatious and permanent than others and seem relatively far and independent of us – these we refer to as '**material**' or 'physical'. The remainder we label '**mental**' or 'imaginary', distinguishing them by their relative poverty, transience, intimacy and dependence on us.

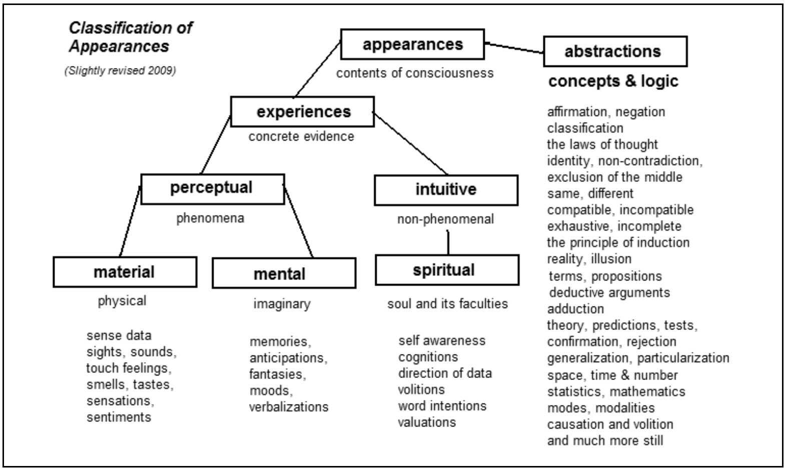
Diagram 19.2 Assumed material, mental and spiritual domains.



Most of our common 'world' (cumulative appearance) is composed of material phenomena, and all or most mental phenomena seem to be derivative replicas of them or of parts of them. Among material phenomena, some are considered 'in our own body' or 'physiological', and the others 'outside our body', our 'body' being distinguished by its relative proximity (to the observer) and the peculiar events occurring in it (sensations and sentiments). Some bodily phenomena (such as sentiments and 'actions') seem to have mental origins, and so are called 'psychosomatic'. Conversely, many mental phenomena are regarded as having bodily causes.

In addition to mental phenomena, we should distinguish the non-phenomenal appearances we may call '**intuitive**' appearances, which are our impressions of self-knowledge (one's self, cognitions, valuations, volitions). These differ from imaginations, in that they per se have no phenomenal expressions, yet they share with mental phenomena the appearance of intimacy and being in our power to some degree. They are assigned a specific kind of consciousness called intuition (whence their name here) or apperception.

Diagram 19.3 A classification of appearances.



Phenomena (mental or material) and intuited objects have in common a status of *immediate evidence*, which we express by calling them '**empirical**' or 'experiential'. Experiences are 'givens', in a way that other appearances (namely abstracts) cannot match. Considered purely in and for themselves, without interpretation or inference, they are unassailable, not requiring any proof. To distinguish them from abstracts, they are called **'concrete'** appearances or concretes.

'**Abstract**' appearances or abstracts may be classed as last in that they seem *derived*, by various means, from the preceding, experiential (concrete) varieties of appearance. These means are collectively labeled 'rational' (implying they proceed from a faculty of reason). The term abstract refers to the primary act of reason, namely abstraction (which depends on identification of sameness or difference, i.e. on comparison and contrast between two or more appearances).

Abstract appearances share with intuitive ones the lack of phenomenal manifestation; we have nothing to directly show for them, they are phenomenally blank. But abstracts differ from intuitive appearances, in that getting to know the former requires a process (comparison and contrast), whereas the latter are directly known (in self-experience). Furthermore, abstract objects are 'universals' and essentially 'external to us', whereas intuitive objects are 'particulars' and very much 'part of us'.

Consciousness of abstracts is called conception, so they are also called 'concepts'. But the processes leading to concepts (our discourse) are far from simple and seem subject to many rules; the latter are labeled 'logic'. Abstracts require proof, and ultimately some sort of empirical grounding. The only exception to this rule is the case of self-evident propositions, which cannot logically be denied without committing a self-contradiction. But even in the latter cases, the concepts involved are never entirely 'a priori', but require some preceding experience to have at all arisen.

Let me summarize here: perception is knowledge of material or mental phenomena; intuition is self-knowledge; perception and intuition are experiences, their objects are concrete particulars; conception is knowledge of abstracts, derived with the aid of

logic from phenomenal or intuitive data. ‘Knowledge’, of course, at first simply means consciousness or cognition – the term is rendered more precise later with reference to cumulative Appearance. ‘Thought’ and ‘idea’ are, by the way, catchall terms that may include a mix of conception (concept formation, conceptualization), imagination (visualization, verbalization, forming hypotheses) and logical discourse (inductive and deductive), all of course implying some experience (sensory or intuitive).

As I have indicated earlier, I am not convinced that qualitative differences alone suffice to distinguish material from mental phenomena. We tend to think of the latter as less clear or vivid than the former, but this is not always the case. Dreams are sometimes extremely vivid and colorful, and the physical world is sometimes misty and unclear. For this reason, I suggest that phenomenology must suppose that introspection is to some extent involved in making this fundamental distinction. We are presumably somehow aware of the *direction of input* of the concrete data. Material data is ‘felt’ as coming from or via the body, whereas mental data is ‘felt’ as coming from a closer source (called the mind). Granting that such ‘feelings’ of direction of source are not themselves phenomenal marks (otherwise we would be begging the question), we must interpret them more precisely as *intuitions*. To be consistent we must say that we do not intuit where the data comes from, but rather intuit in what direction *we turn* our attention to gain access to the data.

It should be noted that we have above effectively distinguished three **substances** or stuffs of existence, matter, mind and spirit. We have based their differentiation partly on the fact that some experiences (those intuited) do not have phenomenal characteristics; and partly (as regards the distinction between material and mental phenomena) on the differences in phenomenal properties and locations combined with assumed intuited differences. All three of these substances may give rise to concepts. We may also presume souls, i.e. spiritual entities, other than our own through their apparent phenomenal effects and by conceptual means.

Just as the phenomenal modalities and qualities and their behaviors are considered as mere varieties of matter and mind,

so the cognitions, volitions and affections of the soul need not be assigned yet another substance, but may be considered as events or properties of that same substance. Abstracts relating to material, imaginary or spiritual givens do not, likewise, require a further substance, but may be considered as mere expressions of these three substances. There is nothing epistemologically unreasonable in assuming substantial differences between the said three classes of object. It remains possible that the three substances are ultimately different versions or degrees of one and the same stuff.

The concept of substance is introduced relative to those of static attributes and dynamic movements, implying a presumed substratum for them. It allows us to presume continuity of something, an individual **entity**, in the midst of motion or change. The various attributes and movements are thus conceived not as mere happenstances but as all 'belonging' *to* and 'caused' *by* an abiding, unifying entity [2]. We also assume that different instances of that kind of entity remain essentially the same (i.e. of same substance) although some of their attributes and movements may differ. Note well that both 'substance' and 'entity' are abstracts. Although material and mental phenomena have phenomenal character, while soul has not, the latter may nonetheless equally legitimately be conceptually posited as being concrete.

These beliefs, in substances and entities, are not immediate certainties but constitute conceptual *hypotheses*. This fact alone does not disqualify them, contrary to what some philosophers suggest. If a hypothesis gives rise to a world-view that is always, all things considered, consistent and confirmed, and no alternatives serve the same purpose as well or better, then it is inductively worthy of adoption. This seems to be the case with regard to the concepts of substance and entity. Without them, we would find ourselves unable to 'make sense' of (integrate, explain) all our experiences and intuitions; no one has to my knowledge managed to construct in detail equally credible and useful counter-hypotheses.

20. EXPERIENCES AND ABSTRACTIONS

Drawn from Phenomenology (2003), Chapter 3.

In the present chapter[17], we shall try and classify appearances in various ways (please refer to **Figures 1**, **2** and **3** for a useful summary and illustration). The objects of knowledge, contents of consciousness, or *appearances* to cognition, include: firstly, the concrete phenomena we perceive either through the senses or as mental projections; secondly, the concrete but non-phenomenal objects of intuition (self-knowledge); and thirdly, the abstract appearances we conceive through inductive and deductive logic in relation to the aforesaid experiences (i.e. phenomena and intuitions).

1. The Objects of Perception

Perceptual objects, i.e. the 'things' we perceive, also called **percepts** or **phenomenal appearances**, are counted as **experiential** or **empirical data**, i.e. concrete (non-abstract) evident givens, on the basis of which knowledge is gradually constructed. Percepts are of two kinds (or sources), the material (or sensory) and the mental (or imaginary), which may be *phenomenologically* distinguished as follows.

(a) **Material phenomena** (or '*sensa*') are at least *seemingly* perceived through the senses. They include the following appearances (and some of their components).

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17 Some of these reflections are already to be found in my 1990 work, *Future Logic*. In 1998, after attending a lecture by Prof. Roberta de Monticelli at Geneva University on the phenomenology doctrine of Edmund Husserl, I wrote an essay summarizing and updating my own views. In 2002 (at about the same time as I was writing *Buddhist Illogic,* which was intended as a companion piece), I began rewriting it all, more fully and systematically, resulting in the present book.

- **Visual** phenomena: the different intensities of light and colors (among which we discern various shapes, sizes, distances, directions) that seem to be perceived through the eyes (organs of sight).
- **Auditory** phenomena: sounds (including loudness, pitch, tonality, direction and other features), and sense of balance[18] (from which, bodily inclination) that seem to be perceived through the ears, organs of hearing.
- The **olfactory** and **gustatory** experiences: odors (fragrant, pungent, fetid, etc.) sensed in nose (the smell organ), and flavors (salty, sweet, sour, bitter, etc.) sensed in mouth and tongue (the taste organs).[19]
- **Tactile** phenomena: the feelings we experience as 'within the body or on it (at the skin)' – contact, resistance to pressure/push and tension/pull (hard/soft, rigid/elastic, heavy/light), texture (rough/smooth), temperature (hot/cold skin or body), electricity (shocks), bodily posture (stand, sit, etc.), movement (of parts or all of body), and visceral pleasure and pain (or their lack, indifference), whether physically caused (sensational) or caused by mental phenomena (sentimental), which we classify as aspects of the sense of touch[20].

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18 The role of hearing in equilibrium is not immediately evident, and is I think historically a relatively late discovery. It is not the hearing organ *per se*, I am told, but another mechanism in the ear, with liquid levels (whatever). The issue here is this: is there a *cognitive* act relative to these liquids, so that we can speak of sensation of a phenomenon; or is the 'information' (that's the wrong word, suggesting consciousness; I here use it as in computer science) simply directly transmitted to the brain as a *physical* process.

19 Some aspects of flavor (in common parlance, about food or drink) are more precisely odors.

20 Note that what we call the sense of touch is a grab-bag of very different functions. The term is effectively used in Western philosophy as an "all others" class. Its colloquial usage is narrower; here, "touching" refers to effecting a physical contact between part of one's body and some other part or body, and "feeling" refers to the resulting sensory experience. I see no utility in making this an issue here, one way or the other. It is up to biologists to decide on more precise classification. I

The field of material phenomena is subdivided into two spaces: one, experienced as close to oneself (the center of experience or observer) and relatively constant (for us, at least in the short term), is called '*one's body*'; and the other, lying further away and more variable, is called '*the environment*'. Both the physical body and the matter beyond it have visual, auditory, tactile, olfactory and gustatory manifestations.

Additionally, certain parts of the body, called the five '*senses*' or '*sense organs*', are regarded as specifically involved somehow in the perception of these manifestations. These organs, located roughly in the eyes, ears, nose, tongue, skin and inside the body, can be observed more precisely using scientific instruments (such as a microscope). They are found to be respectively comprised of mechanoreceptors (for touch, position, hearing), chemoreceptors (for taste, smell), photoreceptors (for vision), temperature receptors and receptors for the sensations we recognize as pleasure and pain[21].

That the sense organs are a *sine qua non* to material perception is evident from the fact that when such an organ is blocked temporarily, damaged, amputated or missing from birth, the corresponding perception is lacking or distorted. But the sense organs are *not alone sufficient* conditions of such perception: our attention to what they reveal is necessary too. Therefore, sensory perception cannot be *equated* to possession of sense organs. It is not the sense organs that perceive. One cannot rightly say that it is the eyes that see or the ears that hear.

Material objects are therefore classed as 'sensory', in contrast to 'mental' phenomena (considered below). The perceived body and sense organs are, of course, *themselves* mere appearances, although are later given a leading role in the mental-construct constituting the naive world-view. The above-listed five kinds

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would however stress the distinctiveness of inner bodily sensations (in the sex organs, in the digestive system, etc.) and sentiments (various emotional expressions) from mere touch sensations; the former feel more chemical than mechanical.

21 According to Curtis and Barnes. They mention pain but not pleasure. Also note, they add that electro-receptors and magneto-receptors are found in some animals, though not in humans.

of material phenomena are called the ***sense-modalities***[22], and their subcategories are called ***sense-qualities***.[23]

What is the common property of the various sense-modalities, and the various sense-qualities, which allows us to group them together under these common names? For example, something in front of me both has shape and color and makes a noise, why do I class the shape and color as sights and the noise as a sound? In truth, shape and color are as different in appearance from each other as sight and sound! Their common character has to be supposed merely relational. That is, we may classify them together not because of their intrinsic 'natures', but because they seem related to us observers by sensory experience, through certain bodily organs.

Note well however that the exact role of the senses in perception remains a mystery. For we have to affirm that we perceive what impinges at entrance of the senses, and not (as naïvely supposed by many) end products of transmission by the senses. Otherwise, we are faced with *a logical problem*: we are not perceiving the objects we claim to perceive, but alleged images thereof. In the latter case, we have no way to compare such representations to their alleged origins, and even no right to suppose the 'original' objects existent. In which case, in turn, the sense organs, as themselves objects of perception, are put in doubt; which brings us full circle to a doubt of the initial premise that we perceive images of objects. But granting, therefore, that we perceive the objects themselves, the question arises: what is the use of the senses, then?[24]

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22 Needless to say, the word 'modality' as used here, to signify varieties of sensory and mental phenomena, is not to be confused with the other sense, of necessary, possible or actual.

23 They are so-called, with reference to the ordinary, naïve-realist assumptions. But my using the word *sense* here is mere convenience, and not be taken to imply such assumptions. 'Sense-modalities' are the modalities of existence (light, sound, etc.) *thought to be* perceived by the senses; 'sense-qualities' are the subcategories of these modalities (e.g. for sight – shapes, light-intensities, color, etc.).

24 See *Future Logic*, chapter 62, for more discussion of this topic.

(b) **Mental phenomena** are appearances resembling material phenomena, but which do not seem to be perceived through the sense organs. Thus, we should more precisely and broadly refer to ***phenomenal modalities*** (visual, auditory, etc.) and ***phenomenal qualities*** (shapes, light-intensities, colors, etc.), and regard the so-called sense modalities and qualities as referring specifically to those apparently manifested via the senses (the material ones).

Although individual mental phenomena seemingly exist independently of temporally simultaneous material ones, this does not exclude the possibility (which I believe[25]) that they are only edited representations of *previously* encountered material phenomena (memories taken as a whole selectively, or taken as bits and pieces and reshuffled). For this reason, it seems proper to define mental phenomena negatively (as above done), as not arising directly through the senses, implying that they probably arise indirectly through creative *projection* of memories of material phenomena.

Mental phenomena are imaginations, projections that may be *involuntary or voluntary to various degrees*, including memories of recent or long-past events and **fantasies** of past, present and/or future events (the latter being anticipations). These may be brought forth for cognitive purposes, or for idle entertainment or other psychological motives. Among mental phenomena, then, we may to begin with distinguish the retrospective from the prospective.

Retrospective phenomena, or **memories**, appear as the past incarnations of the 'present moment', which we assume to have unity and continuity of sorts with the present 'present moment' and to have been brought into the present through *a faculty of*

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25 But the question can be resolved empirically. Does a born-blind man have visual imaginations or a born-deaf man have auditory imaginations? If not, then the mental sense-modalities are ultimately side-products of the material ones. (In *New Scientist*, No. 2416, of 11.10.2003, p. 85, Mary Cox of the Royal National Institute of the Blind, London, UK, suggests that the born-blind cannot visualize or dream. She does not say what specific research her statement is based on.)

memory. The consciousness of past claimed to be possible, directly or indirectly through this faculty, is called *remembering*.

An automatic confidence in our ordinary interpretation of these phenomena would be naïve, but a renewed confidence after due reflection may legitimately occur. What matters to us here is that these phenomena take part *in the present*, and that they *seem* to refer us back into some 'past' existence. This dual presence and absence is a distinguishing feature of the class of retrospective phenomena. The explanations proposed for this mysterious quality of such phenomena (e.g. that we have a faculty of memory that somehow stores information obtained at other points of something called time[26]) require eventual evaluation.

Prospective phenomena, or **anticipations**, project specific scenarios regarding the future. They thus suggest that what we face in the present moment will have some sort of prolongation in the following moments. But we do not in this case posit for ourselves a faculty like memory; we only claim here at best an expectation that things will continue to be or become, and that other 'present moments' will replace the current one (till we 'die', at least).

Just as our here and now is tainted, at least peripherally, with an awareness of a before, a past, so it is with a look forward, to a future, which is not quite part of the present and yet seems potential *in it. Whether justified or not, what concerns us here is that these prospective phenomena take place in the present and yet refer to another extrapolation of what we call time, in a direction opposite to the objects of memory.*

Both remembering and anticipation are essentially *inductive* forms of consciousness, note well, in that the Subject projects some interpretation on the basis of certain minimal data. The 'data' are the present phenomena (of apparent past existence or potential future existence, as the case may be), while the 'interpretations' include the acceptance of things pointed-to by these present phenomena as having some existence beyond the present (in a hypothetical past or future part of something called

26 Note that the occasional failure of memory is one proposition *within* this interpretative framework, to explain certain details.

time). This is in contrast to sensory phenomena, which taken in themselves are devoid of theory (though starting points of theory).

My inclusion of prospective phenomena in this list of components is a debt to Husserl. However, he does not see the inductive nature of anticipation, nor for that matter of remembering. Furthermore, I must add that awareness of these components is no 20th Century novelty. It is found in the mystic traditions (e.g. Meister Eckhart, in Christian mysticism, or to give an Eastern example, in Zen Buddhism), wherever we are encouraged to "live in the eternal present" or to "be here now." What the latter make clear is that remembering and anticipation are not mere adjuncts to awareness of the present, requiring an effort; they are for some reason for most humans *compulsive* and very difficult to avoid. If one thinks about it, this is very surprising, and requires an explanation.[27]

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27 Why is it that we ordinarily live in a glorious or shameful past, or in a hopeful or frightening future, to the point that we lose all awareness of the present most of the time. Another, similar form of escape from the present is by *transcendence* in theoretical thoughts about the present. Rather than be in the present, we seem to almost automatically prefer to be out of it, in a constant stream of fantasies. This is evident in meditation, where we see that a serious effort is required to overcome this tendency. Even when we *want* to stay in the here and now, even when it is *pleasant*, we tend to fly off. Why? Phenomenology has to answer this question.

One obvious partial answer is biological. We have to anticipate the future, because we are volitional animals. We are called upon to make choices in relation to a changing environment, to protect our life and improve it. We have to remember the past, so as to avoid repeating its errors and so as to repeat the lessons learned in it. The present is interesting in both these respects, but it does not provide sufficient information. It remains true, however, that if we are unable to be fully in the present, then our past data is likely to be of equally poor quality and our future expectations also unrealistic.

Incidentally, since I consider that higher animals, at least, also have some degree of volition (though less than that of humans), I regard them as (contrary to what many people assume) not entirely locked in the present. And I think their behavior demonstrates it; e.g. our pets remember us and can anticipate some approaching events. They have

Retrospective and prospective phenomena are conceived as mental projections made to some extent by their observer, and so have the initial status of **imaginations**. Indeed, both are essentially hypothetical, in that they are about things no longer or not yet present to sensory perception, and therefore (this is said without pejorative intent) uncertain as far as it is concerned. I expect, however, that the initial elements in memory of visual and auditory imagination are produced (in the recent or distant past) by sense-perceptions (sight and hearing, at least). This question might be resolved empirically by trying to ask people who are *born blind* or *born deaf* whether they, respectively, see or hear anything 'in their heads'. If, as I expect, they cannot, then the mental phenomenal modalities are ultimately side-products of the physical ones. If, as may be the case, they can imagine sights or sounds, then mental phenomena have independent genesis.

Imagination (the projection of 'images') could also be called 'perceptualization'. More specifically, in the case of visual phenomena, we say visualization; in the case of auditory ones, we could say 'auditorization'; similarly for the other cases, though there are doubts concerning them, as presently explained.

Memories and anticipations are classed as imaginations, note, even though their contents or *intentions* are not necessarily mental, but may relate to outside material events. Unless we suppose a *direct* awareness of remembered or forecast events across past or future time, we must regard them as in-themselves mental apparitions, even if their objects did or will indeed exist as projected in past or future, respectively. When their contents happen to be true, such mental acts may be viewed as indirect awareness of sorts.

As we shall see, imagination is a basic function of intelligence. The observer's creative capacity, to project images in or around himself, makes possible rational acts like comparison, confrontation and hypothesizing which are bases of conceptualization, and logical induction and deduction of

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this ability to see beyond the immediate moment because they too must circulate in a changing environment, etc.

propositions. In practice, imaginations are *rarely purely perceptual but usually involve conceptual and verbal factors*.

Conversely, memories, fantasies and anticipations are never merely abstract or verbal, but always involve perceptual factors. Note in particular the various constituents of our hypothesizing, in everyday pursuit of knowledge. Ideas and theories are mentally formed in reaction to information and as attempts to predict further data. Such anticipations of reality (which have to be tested eventually, of course) include not only our words' intentions or conceptual contents, but a mass of concrete memories and fantasies, which may involve visual, auditory or other constructs, and of course the verbal aspect of our abstract thoughts.

Memories and anticipations involve concrete **visual** and **auditory**, and perhaps other, phenomenal modalities. Allegedly mental visual and auditory phenomena are not counted among the objects of alleged sensory origin, because they can seemingly[28] be experienced even with one's eyes shut or ears plugged, respectively. As for the sense-modalities other than sights and sounds, I am not sure that they are imaginable; their apparent imagination may just be an interpretation of present sensations (see below).

Another relevant feature of mental phenomena is that they are **intimate**, i.e. perceived by the observer only (colloquially, in the case of visual ones, through a 'mind's eye'), and although they do not seemingly interact with material phenomena, projections are experienced or at least regarded as due to an *agency* of the observer – signifying an act of will, a volition by a supposed soul or spiritual entity (see further on). Imagination is not *per se* a case of 'mind over matter'; i.e. material objects (except perhaps the underlying brain) are not affected. Rather, we seem to create a hologram of dots, lines and shadings – and sounds, etc. – in our inner and/or outer mental space.

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28 I say 'seemingly' to remind us that eyes and ears are themselves mere phenomena, so that their materiality can only be concluded by our phenomenological ordering of data, not presumed *ab initio*.

Mental phenomena may be **internal** or **external**, note well. Internal imaginations seem to be located (roughly) inside of one's 'head', *as if* they are projected onto some 'matrix' there constituting an inner space. In contrast, external imaginations seem to be projected out into the outer space occupied by matter, *seemingly* sharing the same extension and intermingling without however directly impinging on it (transparency). Clearly, external projection may involve 'extrapolation'[29]. We need not consider these two categories of imagination as fundamentally different: they may in fact inhabit the same transcendent space but simply be closer or further from the observer, respectively.

External mental phenomena may be quite commonplace *hallucinations*, like having the impression that one still has one's glasses on after removing them (one still 'sees' the frames, and does not just feel the residual pressure at one's temples). But there are more extreme manifestations, like meditative or psychotic or drug-induced hallucination[30]. For example, someone may claim to be a prophet who received the visit of an angel, but in fact just have a strong power of external projection[31].

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29 If someone projects an imaginary star into the sky, it does not follow that his power of projection extends that far. It may go no farther than his nose, and yet 'seem' millions of miles away by a verbal or implicit assumption of perspective. Indeed, when we see actual stars, we do not see the stars themselves, but the light-front from them impinging on our senses, and then assume a play of perspective.

30 All of which are reported in literature, even if experienced by few ordinary individuals. A person who has not experienced them may of course doubt their existence, but if philosophy is to be a broad-based explication, it has to accept eyewitness reports as at least possibly true.

31 Phenomenologically, we call an entity 'tangible' if we experience, in the tactile mode, a feeling of solidity, i.e. pressure or tension (and usually other phenomena like texture, temperature, etc.), in the contiguous part of one's body. One's own body is itself considered tangible, by touching one part of it with another. Contact and shape are further ascertained and confirmed, normally by material visual experiences, or in the dark (and for blind people, I presume) by mental ones. Tangibility is also applied by extension to entities not directly touched, but interacting with touched ones, and so in principle capable of being touched. Ordinarily, an externally seen entity lacking any touch quality would be considered mere hallucination. However, some people

In addition to imaginations, we commonly tend to believe in another class of intimate mental phenomena, which might be referred to as '**mental feelings**', including **moods**, perhaps **esthetic** responses, and other such subtle experiences[32]. These should not be confused with (although they may give rise to) psychosomatic sentiments, which we have already mentioned above and classified as material (in the sense that they occur viscerally in the body, though mentally caused)[33]. Whether we should count mental feelings as phenomenal, let alone existent, is open to debate. We could, so as to acknowledge common belief, hypothetically assume them to be perceptually discernible although very faintly and vaguely. Mental feelings, though diffuse, might phenomenally occur, like imaginations, in a mental space (extending in and around the head and body). Perhaps they are mental equivalents of material feelings, just as mental sights and sounds are equivalents of material ones. If the latter is true, then mental feelings can simply be classed as imaginations, and the parallelism between the material and mental domains is greatly increased.

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claim that spirits (ghosts, angels, etc.), i.e. entities of a substance other than material or mental similar to that of the presumed soul of the Subject of consciousness, can be heard or seen, and (in some accounts) touched or otherwise felt. Clearly, if this were true we would have to expand and modify the present account of the phenomenal and our cognitive powers. I am sticking here to a normal viewpoint.

32 If we allow for the existence of *telepathy* (which I tend to admit), I would possibly include it under this heading. For telepathy seems to be awareness to some extent of the 'thoughts' of others, that is their intimate mental world. If I imagine someone about to telephone me, and he does, I would interpret this not as foretelling a future or as 'X-ray vision', but simply as 'hearing' the person's inner voice thinking "let's call Avi" after which I project an image of that person phoning. Thus, the mental domain might be shared to some extent. The explanation could of course be more material – perhaps we can sense electromagnetic waves emitted by others. (Some animals have receptors of electric and magnetic signals.) For this reason, I leave the issue open.

33 The distinction is thus based on presumed substance and location. Often, we are not sure whether what we are experiencing is physiological (purely physical 'sensations'), psychosomatic (mentally-caused physical 'sentiments') or mental (purely mental 'feelings').

Another possible explanation of our knowledge of mental feelings might be with reference to intuition. In such perspective, they are merely expressions of the self, valuing what it has cognized with a view to eventual willing. They are not objective, in the sense of 'apart from' the self, but subjective, i.e. items of self-knowledge. (More on this topic below.)

Retrospective and prospective phenomena differ from sensory phenomena, in that the former are *re*presentative (they contain *for-other* claims, they have informational ambitions beyond themselves), whereas the latter are usually merely 'presentative' (they are to be taken *in-themselves*)[34]. All experiences are primarily data 'in-themselves', and as such, no matter what their 'quality' (clarity, persistence, etc.), they are indubitable. Some experiences additionally appear as channels to other phenomena, as 'for-other' data; and in this role, they are open to legitimate doubt.

Mental feelings (like feeling good about the world or finding a painting beautiful) and psychosomatic sentiments (like feeling warm love in your chest or fear in your stomach) may of course refer to something outside the one feeling them (i.e. may be 'referential'). In a sense, this may be counted as information about the object (specifically, in relation to the one feeling them). But feelings are not essentially intentional: they can be felt without knowledge of their object. Indeed, usually we experience a feeling, and then wonder what its object might be, and waste much time speculating, proposing alternative explanations.

(c) ***The distinction between matter and mind*** is open to discussion at this stage. Most people (at least those in our time and culture) regard matter and mind as different; this is considered a 'common-sense' fact. But in the 17th Century, the French philosopher Descartes put this seemingly obvious observation in doubt, suggesting that we have no way to tell the difference. I think he was in many respects right, but not entirely.

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34 These distinctions are explained in my *Future Logic*, chapter 60.4.

The *clear inner echo* of outer sights and sounds, our vivid short-term memory, is easy but of limited duration. The recall of longer-term memory of such phenomena is usually more difficult and approximate, as is the fantasy of inner sights and sounds. The following is also evident (in my head, at least[35]):

Mental *visual* phenomena seem to be more vivid and clear while dreaming or in other special mental states, than they do while normally awake. In ordinary mental states, we can usually barely imagine (reproduce or produce) vague outlines and some flashes of color; our will has little control over our inner visions. Whereas in extraordinary states, such as in strong dreams[36] or in deep meditation[37] or psychosis or under the influence of strong psychotropic drugs like LSD, our visual experiences (be they spontaneous or willed) seem more three-dimensional, intense, precise and colorful.

Mental *auditory* phenomena, such as verbal thoughts, on the other hand, seem equally strong whether we are apparently awake or asleep, or in other mental states. Clear inner sounds are reproducible or producible at will in all mental states (except, of course, in exceptional cases of amnesia, sickness or brain damage).

Thus, in the case of sights and sounds, there are notable similarities and differences between mind and matter, which justify our conventional dichotomy between these domains. With regard to *the other phenomenal modalities*, the differences are even greater – between apparently sensed objects, and short– or long-term memories of these, and imaginations awake or asleep or in other states.

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35 Though other people seem to have better powers of visualization than me judging by reports.

36 It is interesting to note, in this context, that dreams are largely involuntary events. The Subject is present during dream as observer of them, and to a certain extent may manipulate them half-consciously, but he cannot be said to be entirely there, as when awake. So we must say that some of the images in dreams are produced by the brain without volitional interference.

37 Presumably prophetic visions, like the very vivid ones reported by Ezekiel, count as ‘meditative’.

It is seemingly impossible (in my mind, at least) to readily reproduce or produce in the mental domain phenomena equivalent to material sensations of smell, taste and touch (in the large sense), so their existence is debatable. This is at least true while awake: neither involuntarily nor at will do I ever recall or imagine, whether clearly or feebly, any of these three phenomenal modalities. I do not remember having experimented this issue while (that was long ago) under drugs, but it would be worth trying.

However, I have often noted seeming smells, tastes, touch-sensations and visceral sentiments in my dreams. However, the question always remains, did I in such cases experience these phenomena in the *mental* domain, or did my visual and auditory dream cause *physical* odors or flavors to be secreted by my body, or even just make me attentive to residual molecules in my nose and mouth, or in the surrounding air, which I then sensed and perhaps fancifully *interpreted* (verbally or by wordless intention) to fit a certain context, i.e. as required for the dream scenario under construction? There is a big difference between mentally (from memory or by fantasy) projecting such phenomena, and mentally reinterpreting physical phenomena as mental phenomena.

The issues involved can best be illustrated with reference to an erotic dream, because that usually involves all the phenomenal modalities. For example, suppose I dream of making love to a beautiful girl:

When I awake, I get the impression that the visual and sound aspects of my dream (the girl's features, her verbal expressions of joy, etc.), and the smells (her skin), tastes (her saliva), touches (our bodies embracing) and emotions (our feelings for each other), were all *inside* the dream. But upon reflection, it seems to me rather that the two sources of information (the mental and physical) were in fact quite separate. Although some mental aspects may be stimulated by physical ones, and vice versa, each remains in its own domain. Only, we 'mix' them intellectually, so as to give ourselves the impression that they occur in the same domain.

Her face and her voice have to be imagined by me, but the points of contact between us need not be imagined, because it suffices for me (in my sleep) to concentrate awareness on my lips or my sex organ to obtain an about equivalent sensation. I thus ask: were the feelings of having sexual intercourse with her and feeling love for her *in* my dreams (like the sights and sounds of it), or was I just feeling my sex organ *physically* rub my underwear and experiencing *newly* generated sentiments of desire and pleasure?

This question is difficult to answer, but as we shall see our apparent ability to 'recognize' such phenomena seems to logically require and imply admission of their mental 're-enactment' at least as faintly perceptible memories. Though perhaps such recognition can be explained entirely with reference to the intuitive faculty, somehow.

It thus seems evident that 'sensed materiality' and 'the mental stuff of dreams' are not quite as similar as Descartes and others imply, in their critique of the common-sense view. The two domains have *some* phenomena of light and sound in common, though not always of comparable quality (i.e. intensity and clarity), and certainly not with equal volitional properties. Other phenomena occurring in the material field have no apparent equivalent in the mental field. And so forth.

Another difference worth noting is that the memory of dream experiences is usually more elusive and tenuous than the memory of awake experiences. Personally, upon awakening I may remember brief flashes of my dreams, but almost as soon as I try to remember more, I forget everything! However, it should be noted that, according to yoga teachings, one can train oneself to clearly recall dreams, by sustained daily effort (including perhaps writing down what one does recall). Thus, my own ineptitude may just be due to my essentially indifferent attitude to dreams[38].

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38 Which is probably unjustified, considering how surprisingly weird or richly imaginative dreams sometimes are. One wonders how a person ordinarily so incapable of spinning a story or composing a painting would suddenly in sleep succeed in such artistic feats!

All this is, of course, very close to the common-sense view. What is the essence of 'materiality' if it is not precisely resistance to personal bodily pressure or pull[39], i.e. specifically a touch sensation upon contact between some part of one's body and another body (or another part of one's body). If this, as well as various other differences already mentioned, were equally producible 'in the mind' (at will or as memory recall) the domain of matter would not seem at all different to us from that of mind.

Thus, in conclusion, I very much doubt the Cartesian contention that the mental and material domains contain all similar phenomena. They simply do not. Matter and mind may have seemed indistinguishable due to a hasty generalization. An equation might be justified as a starting position, but has to soon be abandoned once a distinction between mind and matter is introduced to account for observed qualitative or behavioral differences. If our above analysis of differences in the phenomenal modalities present in these two domains is correct, we would indeed be justified in distinguishing the mental matrix from the physical world as an explicatory hypothesis.

One *could*, even admitting the above objections, maintain that awake living might still be dreaming. Specifically, one could say that there are (at least) two kinds of dream, the *primary* dreams (which we call awake living) in which touch, smell and taste are experienced, and so on (listing all distinctive features), and *secondary* dreams (which we regard as occurring in sleep or under other specific conditions like drugs or natural chemical imbalances), which are dreams *within* the primary dreams, and which are distinguished by *a more limited range* of phenomenal modalities.

The position is consistent, so that Descartes' doubt remains legitimate, and even the idealistic posture of Berkeley and others. There is a Buddhist saying to the same effect, that: "Mind is a dream that can dream that it is not a dream."

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39 Of course, later, Physics will explain the solidity and cohesiveness of physical entities with reference to fields of repulsion or attraction.

However, one could upon further reflection argue that that position *involves a stolen concept*. The meaning of the words such as ‘dream’ or ‘mental’ is grasped *as against* the awake experience that we call materiality. If, as the Berkeleyan posture does, we dissolve the distinction, and call everything dream or mind, then these words lose their initial meaning.

The whole impact of idealism (or mentalism or subjectivism), the provocation inherent in it, is due to our previous experiential grasp of materiality (as hardness, etc.) as distinct from mind-stuff; if we honestly *started* with the consideration of ‘external objects’ as mental just like ‘inner objects’, there would be no shock value.

That is, there would be no *comprehensible* distinction between the words ‘matter’ and ‘mind’. That we understand something different by each of those words shows that their content is different for us and justifies maintenance of a distinction. Matter may be a specific category of mind, or mind may equally well be a very subtle form of matter; but in any case, they *as experienced* are qualitatively different objects in many respects, and those differences cannot legitimately be swept away in one go, as Berkeley and the like do.

2. The Objects of Intuition

Intuitive objects, i.e. the ‘things’ we intuit within ourselves, are also (as we shall now argue) to be counted as concretes, evident givens, or experiential or empirical data, on the basis of which knowledge is gradually constructed.

Our above attempt to parse experiential data into ‘material’ and parallel ‘mental’ phenomena of various modalities and qualities, is obviously incomplete, in that it does not reflect all the items found in ordinary belief (whether the latter is ultimately right or wrong). Many of our common abstract ideas and statements relate to more intimate data, not included in the above list. This suggests the need to postulate an additional class of objects, of immediately apparent particulars, like percepts (material or mental phenomena), and yet not as manifestly displayed (colorful, noisy, etc.). The type of consciousness by which such

appearances may be supposed to be apprehended may here be called **intuition** or **apperception** (although in practice, note, people often broaden the term 'perception' to include such self-experience).

Under this heading, I here refer to things and events such as: one's own **cognition** (I know what I am experiencing or thinking, what I currently believe or remember), **volition**[40] (I know what I willed, i.e. I was aware and remember I 'caused' the act), **imagination** (this is my imagination, I imagined it – even if in some cases I have had thoughts and dreams beyond my control), **valuation (**I like her, I want her, etc. – what might be called 'intuitive feelings', leaving aside their eventual phenomenal effects, like feeling lust for her or enjoying sex with her), or again the intuitive sense of '**I**', of being an *observer, judge and actor* at the center of cognition, valuation, volition, imagination (I know that, I value this, I did so, I imagined so and so).[41]

If we reify such presumed objects of cognition, we might be tempted to refer to them paradoxically as 'concrete abstracts' or 'conceptual percepts', or the like, because they seem to have a

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40 Volition has subclasses. *Intention to do* is a readiness for volition, to be carried out when opportunity arises. *Velleit*y refers to inchoate volition, a beginning of volition not (or not yet) fully carried out. Velleity occurs under various circumstances: one may be indecisive or have conflicting wills, or one's will may be opposed by involuntary factors or tendencies. One or another force may dominate, and the losing volition is then called a velleity. These are details for Psychology to consider.

41 Many psychological concepts intermingle the broad classes of cognition, affection and volition. For instance, *imagination* is volition (as well perhaps as involuntary generation) of mental objects that are then perceived. *Intention* refers to the purpose of volitional action, and involves some imagination of the desired (valued) goal. Volition without intention is rare, if at all possible; the existence of *motiveless* voluntary actions (which might be called *whims*, non-pejoratively) is an issue. *Behavior-pattern* refers to a bundle of volitions. Again, *attitude* refers to a predisposition to volition, implying the possession of certain values, without implying that it is currently put into action. *Character-trait* signifies a bundle of attitudes. And so forth. Cognition is of course a presupposition of all these concepts, at least for humans.

dual character, as it were straddling the domains of perception and conception, of concrete and abstract. More precisely, such apparently introspected certitudes (relating to 'oneself'), on the one hand resemble abstracts, in that they have *no expression in the listed sense-modalities*, but on the other hand they apparently share with phenomena the properties of *immediacy* (i.e. their being directly cognized, *without assistance of a reasoning process*) and *particularity* (they are *individual* objects, not common features). For this reason, it is best to regard them as a separate class of concrete objects, to be called intuitive appearances[42].

We are here considering the most inner of internal cognitions, where the observer observes himself (or herself) and his (or her) most intimate deeds – the awareness of anything, all volitions (i.e. the first move in all actions, be it the willing of imaginations or of bodily movements) and valuations (preferences, which are not actions but presumed inner *antecedents of* actions). Intuition differs from the objects of imagination (including memory and anticipation, eventually mental feelings), in that the latter are the *products* of the imaginative act, whereas intuition has as its object (among others) the presumable causes of the imaginative act, i.e. *the Agent and the agency*. Such intuitions constitute literally **subjective knowledge**, in a non-pejorative sense of 'in or part of the Subject', in comparison to which other mental events, viz. memories and fantasies of whatever sense-modality, are quite 'objective', i.e. the latter are neither the Subject, nor creases or movements within him, though they are indeed often regarded as *caused by* the Subject.

The pejorative sense of 'subjective' is of course that the Subject or consciousness cognizing something is thereby creating that thing (as one creates imaginations), and that this thing exists only in or through such artistic cognition. But if one says that *everything* cognized is imagination, it follows that this very statement about cognition is nothing but a fantasy too. So we cannot do that, logically; sure, we can put the words side by side, but their intended meaning is in fact self-contradictory. The

42 I hesitate to coin a neologism like 'appercepts'.

correct view is therefore that *some* of the objects of cognition exist independently of cognition, they are objective. In this sense, not only are material and mental phenomena objective, but so are putative abstracts relating to matter or mind, and so even are the putative objects of self-knowledge (soul, cognitions, valuations and volitions). These are all placed in the role of *objects* in the event of cognition, and could exist without such cognition (though in some cases their lifespan might well be equal to the duration of that cognitive act, of course).

'Introspection' in a broad sense includes apperception as well mental perception. Similarly, a broad concept of 'mind' would (and ordinarily does) include not only the mental phenomena listed earlier, but equally the observer him/her self and his/her most intimate expressions (awareness, willing, preferring), i.e. all objects of intuition. It may be that the latter are not essentially different from mental phenomena, i.e. that they display very fine, very subtle, very subliminal, very faint – almost but not totally imperceptible – phenomenal qualities; in that case, intuition would be regarded as a kind of deeper inner perception. I leave the question open.

Note well that to adduce such 'intuitive' objects is not to admit just any fanciful candidate for membership in their class. If it is legitimate to (at least hypothetically) admit *self-knowledge* as an additional faculty akin to perception, it does not follow that all other claims to intuition or intuitive appearances (such as direct awareness of God, or reading other people's minds, etc.) are offhand logically guaranteed (or excluded). In my view, we surely have to admit the observer's claims to direct knowledge (experience) of and about himself (or herself); but with regard to other claims there is no such certainty.

It is not because I see and feel my hand move that I think and claim I moved it – if I exist and moved my hand, then *I* have to know I moved it because my will to do so came from *me* (the hand movement being but a distant consequence of that). We give this kind of circular argument (which Buddhist philosophers would reject, denying existence of a self) merely to express that inner certainty, not as a justification thereof. It is here claimed to be evident data, not interpretation. Sometimes, such inner movements or states (metaphorically speaking) are

uncertain; one may well honestly report "I don't you know if I believe or want or did so and so," but this too is a case of self-knowledge!

As earlier mentioned, Buddhists, presumably on the basis of their meditation experiences, claim that the self (and thus *its* having attributes and powers of agency) is an illusion, a conventional (i.e. conceptually generated) shell with nothing (emptiness, vacuity) at its center. Be that as it may[43], our interest here is to describe man's thinking processes as they appear within ordinary thinking, and these seem to include intuition of self and of expressions of self. Consciousness somehow appears to us as having a Subject; and cognitions, valuations and volitions somehow seem to 'belong to' and be 'acts of' that Subject. On this basis we construct propositions like I believe, I prefer, I do, etc. If such objects are not granted some credible reality and knowability[44], then all statements of this sort are meaningless and to be excluded at the outset from all human discourse. What shape grammar would then take, I do not know;

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43 It is I hope clear that what is at issue here, when we speak of a Subject, is not the body or even personality traits of the presumed Subject. The body may be a receptacle of the Subject, over which he has special privileges, but it is not part of him. Personality refers to socially visible aspects, the body, its lines and motions, superficial attributes and actions. Character traits or behavioral tendencies, in contrast, may be considered more indicative of the Subject, in that we refer by them to certain uniformities in his attitudes and volitions over time.

44 A difficulty with the idea of self-knowledge is that it seems to require a *reflexive* relation. It is argued: an eye cannot see itself – so how can a Subject see himself or consciousness turn on itself? But the analogy here may be misleading – as eyes do not see anything, *we* see through them. A better analogy would be sensing one hand with the other hand. The soul or spirit may well be 'divisible', in that it can cognize a part of itself with another part (and therefore in stages all of itself)! I believe, for instance, that what we call (moral or intellectual) 'conscience' is precisely this: a part of each of us (big or small, depending on our personal predispositions) is reserved and assigned the regulatory task of overseeing the rest of one's states and acts. As for consciousness, we may regard the reflexive case as signifying more precisely: consciousness of consciousness of *something other than* consciousness (i.e. an iterative relation).

no one has proposed a convincing model. Fact is, philosophers who deny such propositions theoretically, nevertheless continue to discourse in such terms in practice!

3. Correlations between Experiences

We correlate experiences in various ways. There are apparent **correlations between sense-modalities**. This refers to the associations we record and rely on between sensations in the material domain, in various combinations. For example, the *sight* of my hand in contact with something with such and such a shape or texture is associated with the *touch* sensations that accompany it.

Very often, **correlation between the mental and material domains** is involved. In this respect, there are various possible combinations. One example is sight, visualization and touch: with my eyes closed, the visualization of my hand and an object held by it, is a *tool of interpretation* of the corresponding touch sensations. Another common complex involves sight, visualization, sound and 'auditorization:' I hear a sound apparently coming from a sight, the sight disappears from view, I associate the sound to a visualization instead; then the sound goes, I ally the images of sight and sound in my memory. Also, we have the 'gourmet' complex: the sensations in our mouth are not mere tasting, but a mix of visual images based on sight of the food before ingesting it, smelling, touch sensations of shape, texture and movement, muscular sensations of mouth, tongue and throat movements, and even the sounds of chewing!

It is important to note that what at first sight seems like *direct* correlation between sensations is often *mediated* by mental projections. We often loosely speaking refer to the different phenomenal modalities of space. That is, there seems to be a visual space, an auditory space, a tactile space, etc. We have the impression that we know analogies of space through the various sensory organs, but it is not strictly speaking the case. We in fact mentally project visual space and its properties into the other sensory modes.

We localize the tactile phenomena in our body (contacts, pains, etc.) with reference to a visual image of the body. This image is based on our external visual perceptions (through the eyes) of the body, like a photograph in memory. When the eyes are closed (or simply unused or otherwise occupied), the visual image is inwardly projected in lieu of the actual eye-vision of the body. This is used as a coordinate system, through which ***we map*** touch sensations within our body or on its surface. For instance, close your eyes and put two fingertips apart on your desk; with regard only to touch sensations there is no distance between them, they are just two isolated events. You do not 'feel' the space between them, but rather interpose a space between them by imagination. Similarly, if you run a finger over your desk, it is only by *mentally* tracing a line between its various points of contact with the desk that you can say that the finger had a continuous trajectory. The sounds we hear and other sensations may likewise be mapped in a mentally projected equivalent of space, extending out beyond one's body.

There are, of course, yet other correlations – equivalences and causal relations – between the mental and material domains. For instances, the relations between thoughts (verbal and non-verbal cogitations, based on immediate experience or memory) and sentiments (visceral feelings), or between emotions (evaluations and their mental and bodily expressions) and breath (as e.g. when it is speeded or deepened by desire or fear).

4. Conceptual Objects

The objects of conception, i.e. the 'things' we conceive, also called[45] **concepts** or **abstract appearances**, are *not* counted as

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45 Note that it is inaccurate to use the term *noumenon* as equivalent to abstract (by analogy to the equation of phenomenon to concrete), as some people tend to do. The term noumenon refers to things hypothesized to exist beyond and in contradistinction (and even contradiction) to the phenomenal world, whereas abstracts are things existing in addition to and in harmony with concretes. The noumenal is a transcendental domain, claimed without justification to be ultimate

empirical data (unlike percepts, and eventually objects of intuition) but must still be granted due consideration as appearances. Abstracts may be *phenomenologically* distinguished from material or mental concretes as having none of the phenomenal modalities – we cannot see them, hear them, smell them, taste them or feel them in any way, on a material or mental plane. Abstracts may also be distinguished from objects of intuition, in that they are not particulars. Abstracts are *the assumed common features or measures or degrees* of two or more percepts and/or intuited items and/or other abstracts in simple or complex combinations.

Not to confuse here, the ***words*** we conventionally, by intention, attach to abstracts, which thereby and thenceforth become for us the material and mental phenomenal manifestations *of* abstracts, tools to facilitate recording, storing and transmitting of information. Words may be facial expressions or bodily gestures, visible shapes or colors, hearable sounds or touchable epigraphs or Braille – but *what* they symbolize (their intended references or meanings) may have no phenomenal qualities and no intentions.

By 'abstract', then, is simply meant any object of discourse other than the phenomenal or intuited. Many abstracts seem somehow almost 'given in experience', and yet they cannot be pointed-to as clearly as experiences. For instance, 'squareness' is something we seem to see in all phenomenal squares, whether in the outside world or in our heads; yet we cannot show it except by drawing a sample square of particular size and color. We have no access to the *universal* except through *individuals*. Thus, the conceptual is in a sense apparent, like the experiential, but its epistemological status is inferior, because while the perceptual or intuitive is immediately accessible as a singular thing, the conceptual requires a plurality of data, out of which it is gradually differentiated by comparisons and contrasts between different parts of the field of appearance, and more broadly between different fields of appearance over time.

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reality; whereas the abstract is essentially immanent, part of our everyday reality knowable by ordinary means.

We call abstract object of cognition any thing or relation we infer (or at least suppose or assume) by conceptual/logical means, including **terms, propositions** and **arguments**. Although they are *per se* imperceptible, and not intuited, abstracts may be (indeed ultimately have to be) associated to experiential phenomena. We might characterize them as ***rational*** objects, because *logical insight and discourse* are involved in their cognition[46]. They are end products of reasoning processes of varying type and complexity, (which may be hypothetical and probabilistic), based on and guided by (sensory or introspected) empirical evidence. What lies behind an abstract term like ‘quark’ or ‘happiness’ – what the term seems to us to refer to, what makes it meaningful to us – is what we reify as an ‘abstract’ thing. Like an experience, it is granted possible if not actual reality of sorts (while admitting that in specific cases, it can be shown that what we assumed was illusory – e.g. ‘unicorn’).

It should be noted that I count ***logical insights*** (such as awareness that there is a conflict or harmony between different percepts, intuitions or concepts) as abstractions. They may be described as virtual ‘sensations’ of imbalance among certain appearances, whence arises in us an incredulity, a question requiring an answer, and equilibrium is recovered only when a convincing answer to the question seems found[47]. We feel ‘compelled’ by honesty to resolve logical issues when they arise. Logic is thus based on a certain affectivity, a capacity for intuition of our level of belief in or peace with certain

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46 I of course include here false insights or wrong logic – calling them rational is not intended as a blanket approval of all human discourse. That reason is fallible is not denied, only that it is sometimes correct and true is maintained. For to deny reason an *occasional* efficacy is self-contradictory, since such denial is itself attempted rational discourse.

47 The logical insights of incredulity (negative) or conviction (positive) may be considered 'feelings'; but I doubt we may regard them as concrete feelings in the body or head (though they may occasionally produce sensible anxiety or satisfaction), they are rather to be classed as abstract and should be 'objectivized' as much as possible. In any case, it is clear that my view is far from a classical rationalism, which regards logic and feeling as opposites.

appearances, within a specific context of knowledge and degree of attention.

If we have even a mere *impression* ('rightly' or 'wrongly') that a given experience or a given hypothesis is somewhat 'misplaced' or otherwise 'inappropriate', this impression must be counted as part of the sum total of appearances on which judgment is to be based. It is with respect to all our impressions in a given moment (however vague or clear, right or wrong to start with) that we develop considered judgments on any one of these impressions. It follows that we are correct (*ab initio*, at least) in counting logical insights as objective, in the sense that they belong to Appearance and not to the Subject. That we may also regard them as 'feelings', or again as 'compulsions' of sorts, does not detract us from this position. It is not an arbitrary preference, but itself logically convincing.

Note well that logic is not, as some modern commentators have come to imagine, an issue of language or even of form (these are but technical aspects). It is primarily an apprehension of problems inherent in appearance (or between appearances), and of possible solutions to such problems. The problems and solutions are *themselves* apparent! Aristotle has identified three broad classes of logical issues. identity (acknowledgment of things as they present themselves), non-contradiction (conflicts between phenomena and their apparent resolutions) and the excluded middle (dealing with gaps in knowledge and otherwise unsatisfactory ideas).

Conception of the simplest sort has to begin with a **simple** insight, a direct consciousness of some abstract aspect of some perceived or intuited particulars. This position is needed to explain the comparisons and contrasts that determine conceptualization, and likewise the logical confrontations that order knowledge. 'Similarity', 'difference', 'more or less', 'contradiction', 'consistency' and other such immediate objects, are obviously not perceptible or intuitive qualities, but undeniably abstract[48]. More **complex** conception is 'built up'

48 And, I remind you, logically undeniable, since in the very attempt to deny them you use them and therefore contradict yourself.

from such simple conceptions, but not like bricks piled up on each other. Relations more complicated than mere ‘addition’ are involved, with terms inside terms, inside varieties of propositional forms, buttressed and intertwined by varied arguments.

Thus, the term abstraction should be understood very broadly as including simple insights and *summaries* of qualitative or quantitative similarity or difference between experiences; more complex conceptualization, *interpretations or explications* requiring adductive trial and error; propositional relations between concepts; logical insights, judgments and tests; deductive and inductive principles; specific logical methods and techniques of all kinds. Note well that abstraction is based, not only on similarities (as some philosophers absent-mindedly seem to suggest), but also on differences. *The negative aspect is as important as the positive*. Note that another factor, which I also often forget, is the insight of degree or proportion. Things not only seem the ‘same or different’, but also ‘more, equally or less’ this or that. A full account of comparison and contrast must mention this quantitative aspect, which is not reducible to the polar issue of mere qualitative presence or absence.

Abstracts are unconscionable without some sort of prior experience, be it material or mental perceptions or intuitions of self. *If we had never observed anything, we would have nothing to ever conceptualize.* This is a basic principle, thanks to which many errors can be avoided. Philosophers often *use a concept to criticize or deny the very percepts on which it was originally based*, committing a variant of the ‘stolen concept’ fallacy. If one keeps in mind the order of things in knowledge, one will not waste one’s own and everyone else’s time with such stupidity. Many philosophers, out of a failure to carefully observe and fairly evaluate cognitive processes, have fallen into skepticism and peddled confusions which have caused much damage in people’s minds and in society. We shall in the course of the present research review some of our core assumptions with regard to abstract knowledge, with a view to justify it in principle. What will hopefully be made manifest is that the principal justification of abstraction is its grounding in empirical data; it is not something ‘a priori’ or ‘transcendent’.

The essence of concepts is that they provide summaries, interpretations or explanations of phenomenal or intuitive particulars. Their primary orientation is thus more objective than subjective, whether what they refer to is self or other. That is to say, when the Subject forms an abstraction about the self, it treats itself as a cognitive object like any other in that context. Also, although such comparison and contrast constitute work by the Subject concerned, it does not follow that it is 'subjective creation'; it is dependent on a performance of the Subject, but it does not 'invent' its object.

The proposed ordering of the data, emerging from the activity of abstraction, is inevitably inductive as of when it takes longer than a single moment. For only what is given within a moment is pure evidence, whereas the putative links and other relations between moments are mere hypotheses confirmed by these moments (and others eventually), since as we have said beyond a given moment we depend on memories and anticipations. For this reason, the conceptual has a lower status than the empirical. Not as some suppose, "because the abstract is not inherent in the experiential," but because the extraction of concepts from percepts and intuitions depends on time-consuming and therefore potentially faulty processes.

Terms, propositions and arguments may therefore ultimately, all things considered, be found 'true' or 'false', in one sense or another. The false ones may be deliberate pretenses, or sincere but unsuccessful attempts to report information. The fact that some abstractions are erroneous in no way justifies a skeptical judgment about abstraction as such, since *such judgment is itself abstract*. No one can consistently advocate the elimination of all abstracts from human knowledge. One cannot even tell oneself (verbally or in wordless intention) to stop using them, since such comprehension or collective intention itself involves abstraction. *Some* abstracts must thus be logically admitted; the only question remaining is, *which?* If the basic abstracts of similarity and difference or of compatibility versus incompatibility are understood and thus granted, there is little reason for denying *other* abstracts – for *to deny some abstracts only does not have the same force as denying them all*.

Abstracts are the objects and outcomes of discourse, but should not be viewed solely in this perspective. Their epistemic role is not their whole story. They may be serious or playful, in the foreground of consciousness or in its background or underground. As already stated and as we shall see in more detail, abstracts involve and are usually in turn involved in imagination, meaning memory, fantasy, and anticipation; for instances, memory of their perceptual basis, fantasy of the words symbolizing them, or anticipation of hypotheses. Abstracts are also affected by and affect our innermost life; for instances, an emotional prejudice can affect one's philosophizing or a philosophy of self can modify one's choices.

5. Degrees of Interiority

It is important to note well, in the above dissertation, the implied degrees of interiority, with reference to 'distance' of events from the observer.

Five (or six) degrees of interiority are distinguished regarding **emotions or feelings** (taking such terms in their broadest sense), with (starting from the most distant):

(a) sensations felt when one touches something with one's skin or in one's mouth or nose (these might not be counted as emotions, but one is said to feel them);

(b) visceral sentiments, pleasures and pains experienced as *in the region of the body* (including the head), whether through purely physical causes (e.g. the pain of burned fingers or hunger or a stomach ache after eating something hard to digest or a headache due to noise) or due to mental causes (or psychosomatic – e.g. fear felt in one's solar plexus or sexual enjoyment or the warm feeling of love in one's chest);

(c) 'mental feelings', i.e. concretely felt, not in any bodily location, but in the mental plane, if such things can be said to exist;

(d) eventual mental representations (as memories, imaginations, dreams) of these sensory (and possibly

mental) experiences, thanks to which we can remember and recognize them, and often evoke them;

(e) the self-expressions of the Subject, the attitudes implied by velleities and volitions, the value-judgments or valuations implicit in his choices; and

(f) abstract implications of behavior and of introspected emotion (of the preceding four types), known by reasoning processes.

A particular emotion (mood, urge, whatever – any ‘affection’) to which we give a name, is usually *a complex of many or all of these types of feeling*, relatively concrete and passive ones like (a), (b), (c) or (d), or relatively abstract and active ones like (e) or (f). Rarely do we refer to ultimate units of emotion alone. By distinguishing the various meanings of ‘emotion’, we are better able to analyze and understand particular emotions. For example, “I am in love with her” cannot be reduced to pleasant feelings in one’s ‘heart’ or in one’s sex organs or even to self-knowledge of one’s abstract evaluation. ‘Being in love’ may mean that one experiences concrete sensations (the feel of her skin) and sentiments or mental feelings (pleasure, desire, admiration, pain, fear, guilt, shame, pity, etc.), while in contact with or when thinking of the person concerned, or it may refer to a very platonic direct (I like her) or indirect (she’s nice, worthy of love) evaluation and a resolve to a certain line of action (doing good to the person loved), or both (usually). One’s consequent voluntary and involuntary actions (over a long term) would also be considered important empirical tests and indices, relative to which one could objectively judge whether and to what degree love effectively exists or is pretentiously claimed (a fantasy).

The knot of emotions may, for instance, be iterative, with observation of certain conjunctions of sentiments or deeds causing additional sentiments (for instance, one may feel guilt in view of one’s desiring or kissing someone). Also, one may have conflicting emotions; there is no ‘law of non-contradiction’ with reference to emotions. ‘I like X’ and ‘I dislike X’ (or ‘I like non-X’) are not considered logically contradictory but merely, say, incoherent or at odds, in that they call on ultimately mutually

destructive courses of action (cross-purposes). That is, 'I like X' (in a given respect and time) denies 'I do not like X', but does not logically imply 'I do not dislike X' (or 'I do not like non-X'). We view the soul as potentially 'a house divided', with parts of it inclining one way and others inclining other ways. Indeed, our psychology is built on fragmentation between our 'conscience' charged with moral supervision (to different extents, according to the person – some may even have no such reserved segment of self) and our impulsive tendencies (which conscience may disapprove).

Returning to degrees of interiority, the same distinctions apply to the allied faculties of the human psyche. We have of course **cognition** of the five or six types of 'emotion' listed above – they do not just exist, they are cognized by the Subject. And similarly, **volition** can be viewed at various levels or depths. If I move my hand, I can focus on the tactile or visual sensations of my hand, the feeling and sight of its motion, or the pleasure or pain such motion may give rise to, or the visual imagination of my hand moving (with eyes closed), or the purpose or causes of its movement (i.e. on the mentally projected achievement sought by such movement, or on the conceptually supposed processes by which it occurs), or lastly on the intuited act of willing. A particular volition may involve any or all of these aspects.

Strictly-speaking only the most inner act of willing, known by self-knowledge, may be labeled as volition – all subsequent events are regarded as mere effects of it, mental or physical reactions to it. The will is never involuntary, only imagination or bodily movement can be involuntary. In the mental realm, images can be projected involuntarily, as in dreams. In the physical realm, forces outside the body can move it and it may have internal dysfunctions (e.g. paralysis) or missing organs (e.g. a cut hand). Whereas the presumed will (within a limited range) is always within our power, a free act of the soul, and the first act in any 'volitional' series. Thus, volition as such is regarded as a spiritual act impinging on the other two domains, the mental matrix of imagination (which matter can also impinge on) or on matter (which imagination per se cannot however impinge on).

These domains cannot directly or mechanically impinge on the spiritual, but only through their cognitions by the Subject. *Cognition* is always (or at least usually) antecedent to volition, giving the Subject issues to respond to, but not determining the response. Cognition gives rise to value judgments and attitudes of the Subject, i.e. events in the spiritual realm. But even these subjective antecedents of volitional action do not definitively determine volition; the Subject still has to will an action in the direction they suggest. Cognition (and its objects) and valuation (or more broadly, emotion) are thus said to '*influence*' actions (make them more likely than others), but only volition can be said to *determine* actions. 'Volition', thus, refers most precisely to subjective movements of the Subject – he is their sole cause, in the sense of *Agent* (or Author or Actor). Such movements have no existence without the Subject, they are not end products of his acts, they *are* his acts. He is directly responsible for them, their perpetrator. Subsequent events (e.g. hand moving) are not volitions, but (usual) effects of volition, though loosely called 'volitional'. For the latter, he has (usually) only indirect responsibility, for other forces can affect them.

By means of the stratification of objects here proposed, we are better able to understand what we mean by freedom of the will. But deeper considerations of causality and causal judgments shall be dealt with separately.

21. CONCEPTUALIZATION

Drawn from Phenomenology (2003), Chapter 4.

In the present chapter, we shall try and clarify the processes of conceptualization, i.e. how we develop abstract ideas from the data of experience. Many philosophers have previously attempted this difficult task, but have strayed into error or irrelevancy due to their failure to grasp all the logical issues involved. We need to explain how comparisons and contrasts are effected, without engaging in circular reasoning. We need to show that logical tests are not arbitrary standards, as some accuse, but constitute the only honest and sane way to assess any data input. We need to clarify verbalization, and ensure that it does not skew our ideas. We may also try and propose a theory of 'universals'.

1. Sameness and Difference

Alleged apprehensions of sameness and difference are the primordial basis of all concept-formation, that is of grouping and naming or classification. These are of two kinds, *particular* sameness or difference, which relate to purely perceptual (material or mental) or intuitive (self-known) items; and later *abstract* sameness or difference, which relate to conceptual products of the former. Or we could say more precisely, sameness and difference on a particular level are the foundations of abstraction, i.e. whatever we judge same to each other and different from other things become thereby members of the *first* abstracts, all others being ultimately *derived* from them.

An important insight or principle we may suggest at the outset is that **similarity is not something we apprehend – it is *dis*similarity we apprehend; similarity is just the absence of dissimilarity**. Thus, despite the polarities we have given the words, similarity is something negative, whereas dissimilarity is something positive. Everything seems the same to us, till we

discern some difference. We judge things singular or same, if we have noticed no plurality or difference between them. Thus, strictly speaking, dissimilarity can be experienced, whereas similarity is a rational object.

Let us first consider certain percepts (material or mental objects of perception) in the visual field (specifically, shapes), and then we shall turn to other visual percepts, as well as auditory percepts and those in other sense-modalities.

When faced with two visible *material* percepts (phenomena appearing *at the same time* in the visual field), we 'compare' them mainly by mentally projecting (externally imagining) parallel lines from points on the one to points on the other (the points being imagined subdivisions of the phenomena, into light or dark dots – digital 1s and 0s). If all such lines pair-off dots which are both alight or both dark, the objects are judged to be completely similar (identical); if no dots thus correspond, the objects are judged completely different, if only some correspond, the objects are judged in some respects *same* (similar) and in other respects *different* (dissimilar). There are thus *degrees* of sameness or difference.

Such **comparison** (in its widest sense, including both comparison with the positive aim of finding points of similarity and that with the negative aim of finding points of dissimilarity, i.e. 'contrast') thus involves an imaginative act (specifically, a hallucination of mental lines into the material region of space), but its result is given by the visual phenomenon (there evidently are or are not pairs of light or dark dots at the two ends of the lines).

Another, less direct way we compare visual material objects is by externally projecting a mental image of one object (usually one perceived previously, whose image is thus stored in memory) onto the other material object (currently present in the visual field). Such *juxtaposition* primarily occurs when the two material objects are not simultaneously present, or so far apart in space that focusing on one turns one's attention away from the other so that they cannot strictly be regarded as sharing the same visual field at the same time. In such case, we overlay an image of one object on the other, and consider and count how

many dots cover each other over and how many do not[49]. Here again, an imaginative act is involved (projection into external space of a mental image or memory), but the judgment is based on passive observations.

A third, still less direct way is to compare and contrast mental images of both the material objects under scrutiny – this may be used for instance if neither object is present long enough, both being too ephemeral. Other ways are experimental: the observer may seemingly move himself relative to the two objects so that they are in the same line of vision (appeal to perspective) or seemingly move one object so that it is physically on top of the other and blanks it out in every direction[50]. Such physical experiments do not per se involve mental projections.

In practice, all these various ways might be used in combinations, reinforcing each other or mitigating our judgments somewhat (as to the degree of similarity and dissimilarity). Physical experiments may be criticized as actually changing the visual field, in that what is compared after said movement is not the original scene, but a new scene – in which case, we have to in fact appeal to a memory (i.e. a mental image) of the object moved, juxtaposed on its alleged new manifestation, and judge the two as the same by an inference (image 1 is like object 1 and like/unlike object 2, therefore objects 1 & 2 are like/unlike). Therefore, even such experimental comparisons involve imagination.

In addition to comparisons of shape, we must consider comparisons of size – that is, the *measures* or *degrees* of things. Two things may have the same shape, but different sizes. To deal with this problem, we introduce the concept of *proportion*. Comparative measurement is an experimental act in that, in

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49 In such case the mental projection does not entirely blank out an identical material object, but effectively hides it sufficiently.

50 The smaller one will be placed relatively closer to the observer than the larger one, and both may be gradually rotated, so that all their ‘sides’ are effectively juxtaposed and compared. Such manipulations are regarded as mere *positioning* of the objects, and granting the hypotheses underlying perspective including continuity of adjacent phenomena the objects themselves are not affected thereby.

imagination or physically, we bring to bear a standard of measurement, a graduated measuring rod. In visual imagination this simply means that, instead of comparing dots (as above), we compare collections of dots – dashes (lines of two or more points), while ignoring or making note of the differences in their numbers of constituent dots (according as we are satisfied with imprecise proportions or need to be exact).

Considerations of 'scale' often involve a mental act of 'zooming in'. In *Buddhist Illogic*, I state:

> Now, the zooming in is merely production of a new image – so we are not even, in fact, repeatedly subdividing the same image; we merely *say:* 'suppose this image is a detail of the preceding'. The new image has the same size as the preceding, but its *scale* is declared different.

It is worth stressing here that this declaration need not be verbal, and is more precisely *an intention*. That is, we intend some visualized line to be considered as *a portion* of another visualized line, even though both lines are in fact (about) the *same* size when projected in our heads. Neither the mental projection of images, nor a verbal declaration, can fully explain 'proportion' – we additionally must, note well, refer to the *intuited* intention that this line 'represents' a fraction of that line. Thereafter, we can specify how many such fractions would equal the whole.

The mental drawing of lines first mentioned may also be criticized as taking time and involving shifts of attention, so that by the time the lines are drawn it is no longer the original two objects that we are comparing but our many mental images (memories) of them. However, these various images have each in succession passed the test of correspondence with their original objects (image 1 matches object 1, image 2 matches object 2) – we express this fact by calling them '*representative*' – so that we may justly infer the resulting judgment (that objects 1 & 2 are the same/different) from the equality or inequality of their images. In conclusion, the comparison and contrast of material objects may well generally involve mental projection of

images of their objects, though many rely mainly on projection of lines between objects too.

It should be mentioned that visual experiences do not only involve shapes, but also light-intensity (shadings) and frequency (colors). How for instance do we recognize various colors as all green, say, although they range noticeably? For such qualities, an argument by analogy seems called for. It is also by analogy that we must here try to explain comparisons with respect to the experiential fields of *the other sense-modalities*, sounds, smells, tastes and touch phenomena. Presumably, we mentally cut up the experiences into elementary phenomena, which we then compare to each other or to imaginary substitutes, or experimentally determine in some way (e.g. at later stages in development, we could record sounds into a computer and have it project on its screen visible waves which mathematically correspond to the sound waves concerned).[51]

Whereas material phenomena of light or sound have obvious mental equivalents – we can think visual images (including colors) or speak to oneself (i.e. in one's head) at will – it is not immediately evident that we can produce mental images (memories) of smell, taste and touch phenomena at will while awake (though my own introspections suggest they do occur in dreams while asleep). Be that as it may, unless we can think up some fitting alternative theoretical scenario, we have to assume the doctrine that imagination (or at least memory) of these sense-

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51 It should be kept in mind, in this context, that color, sound, odors, tastes, touch-sensations and feelings all seem to have spatial as well as temporal aspects, which give rise to our *correlations of sense-modalities*. Thus, the sense of depth in the surrounding material world is not only due to perceptions and conceptions of perspective, but also to various sound and touch sensations, which add body to visual depth. The sounds or smells we experience have direction, with reference to movements of their external source in space or of our body relative to it. The food we eat has a location and shape/size and texture in our mouths and tongues, a hardness or softness and certain sounds under our teeth, not just a taste and smell. Such inferences of spatiality are based on very complex hypotheses involving both perceptual events and conceptually assumed causes and conditions.

modalities is possible, since we evidently are able to *recognize* such phenomena![52]

We should also consider comparison of *mental* objects of perception. With regard to the visual field, first, internal or external imagination of lines, joined at will from point to point of any two objects, would be a sufficient hypothesis. There is no logical need, here, to produce a mental image of either mental image, since just as soon as the primary mental objects are thought of (with a view to compare them) they are present in the mental visual field and such imagination would be redundant. But one can, rather than mentally draw lines between them, mentally move one mental object over to the other, juxtaposing them for point-by-point confirmation of similarity or difference. Such moving seemingly does not require further confirmation by images, since it is as it were guaranteed by the observer's introspected will. Similarly, supposedly, for the other sense-modalities.

Comparisons and contrasts between intuited particulars, on the basis of which abstracts concerning the psyche are assumed, are more difficult to trace. They evidently occur introspectively somehow, but I cannot at this stage suggest just how, so I will leave the issue wide open.

The above-mentioned first abstracts are only among the most basic. From their application a whole world of more specific or generic abstracts is gradually inferred, adduced or assumed. For example, there are also, we assume by analogy from phenomenal and intuitive feelings, 'abstract feelings' inferred from the value judgments and behavior patterns of the observer. These are not

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52 For instance, I can recognize a smell as that of a rose, i.e. as similar to smells previously experienced and classified as rose, even though I don't seem to be able to reproduce an 'image' of that *smell* in my head at will. But interestingly, in a dream I might apparently 'smell' a rose, though none is nearby. No doubt also, different people have different facilities in respect of perceptualization. I am sure some people can visualize things in their heads better than me, so maybe some can actually imagine the smell of a rose.

to be confused with pleasure/pain[53] sentiments (which are physiological phenomena, i.e. concrete material phenomena experienced within the body), which may occasionally be caused (we believe) by abstract feelings. Nor should we confuse these with what I have earlier named 'mental feelings' (if any such exist) and 'intuitive feelings' (which are raw data for abstraction). Abstract feelings are hypothetical entities, stretching terms by analogy; they are more judgmental, or rational in nature.

With regard to cognition of more abstract sameness or difference, then, we should in principle regard our identifications as *hypotheses subject to the laws of adduction*. The concepts of concrete sameness and difference are by analogy extended to include presumed/alleged/postulated abstract sameness and difference. We do not directly 'see' abstracts as same or different, as we do concretes. Rather, we postulate that something akin to sameness or difference relates two given abstracts (respectively inferred as above described), and then test this theory by adductively confirming or rejecting it, in competition with conceivable alternatives. The process of comparison is here less direct, and less permanently sure in its results.

In practice, the objects we compare are rarely simple visual shapes, but complexes with many aspects. All the above-described concrete processes, and additionally many abstract ones, will be called upon in tandem for any given act of

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53 *Indifference* is sometimes counted as a third kind of sentiment, though strictly referring to lack of sentiment. That is of course because the absence of pleasure or pain signifies underlying value-judgments that exclude interest by the Subject in the object concerned. Additionally, we should note that some sentiments are of *uncertain* polarity, i.e. we find it difficult to say whether they are pleasure, pain or perhaps both at once. This is said apart from the fact that one thing may *cause* opposite sentiments, as e.g. when a masochist is whipped and feels both pain in his back and sexual pleasure. I here mean that one and the same sentiment may be ambiguous (so that the Law of Non-contradiction may not be applicable with reference to pleasure and pain, i.e. they are not strict contraries). Similarly, and all the more so, with regard to abstract feelings.

comparison. So, it is difficult to describe comparison in a succinct manner. For instance, let us compare two carpets on my living room floor. I can basically relate them in respect of their rectangularity by drawing lines from the corners of the one to those of the other. This is possible even if they are different in size or differently placed, by calling on perspective adjustments. But if one were round and the other square, this would be inconclusive, and I would have to refer to their color or texture (a touch phenomenon), or more abstractly to their fabric (wool or cotton) or even their function (warmth, decoration, etc.). Or comparing two trees, I would not expect their overall shape to be always similar, but would refer instead to bark and leaves, or cells viewed under a microscope, or more abstractly to observed biological processes (themselves complex).

In conclusion, sameness or difference are geometrical judgments at the simplest concrete level of visible shape, but at more complex levels, other sense-modalities as well as abstract hypotheses and inferences (themselves somewhat based on previous concrete experiences) are generally taken into consideration in determining sameness and difference[54]. Nevertheless, I have attempted here to postulate a scenario, which would credibly explain how we apprehend sameness or difference, already to some extent, at the simplest concrete level. I personally see no alternative explanation yet, and so regard it as a good working hypothesis, justifying our comparisons (to the extent that we have been attentive enough, of course). It is acknowledged, however, that even apparently simple cases are usually far more complex in fact, and it is difficult to describe such processes precisely, as they vary tremendously (involving many sense-modalities, and conceptual/logical work too).

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54 How precisely that occurs with regard to the other sense-modalities is admittedly left vague. We should regard comparisons and contrasts in these sense-modalities to be less reliable. Ultimately, I think, we have to refer to a theory that these other sense-modalities consist of vibrations subliminally perceptible to some degree by being somehow reducible to light phenomena, comparable with reference to correspondence of dots. Similarly with regard to intuitions.

Direct or indirect comparison/contrast may be considered as principles of logic, insofar as it is on their basis that we begin conceptualization. Once percepts of any kind are thus declared same or different in certain or all respects, we mentally *group* their images in our minds (probably more precisely, link their memories in the networks of our brains) and, usually but not always, *label* them with a name (i.e. a physical or imaginary sound – and in the case of written language, a visual symbol). The value or utility of naming is that it provides us with an easily invoked substitute for experiences difficult to bring to mind (like smells, tastes or touch phenomena) or more abstract concepts.

It must be emphasized that the mystery of sameness and difference cannot (as some philosophers have tried) be explained-away by just saying that the arbitrary names we give to things are their only common grounds. Logically, this hypothesis begs the question, in that names *too* have individual instances, which must be judged same or different!

The prime concepts resulting from such grouping and naming (effectively these are propositions, like 'x is same to y, therefore both shall be symbolized by z') may then serve as objects in eventual derivative 'abstract' comparisons, which in turn may yield more abstract ones still, as classification progresses higher or deeper. It should be clear, at least if the above explanations are naturally convincing, that the role of imagination in comparison processes does not detract from the *objectivity* of the sameness or difference concluded. The mental projections involved do not affect the material objects they try to represent (and are shown to do so by matching) – they are not 'mind over matter' type volitions, arbitrary manipulations – they are merely juxtaposed. For this reason, we can fairly regard our prime concepts (and their eventual derivatives by inductive logic) as 'empirically' based and epistemologically justified.

2. Compatibility or Incompatibility

Allied to sameness and difference are the concepts of compatibility or incompatibility, which underlie what Aristotle has called the three 'laws of thought' – identity, non-

contradiction and exclusion-of-the-middle. How do we apprehend things (percepts, intuitions, concepts and propositions about them) as able to coexist (compatible) or as unable to do so (incompatible) or problematic (not established as either compatible or incompatible)? We must answer this question urgently, if we admit that these logical processes of **confrontation** (or facing-off) are as basic as those of identifying sameness or difference. The whole of logical science is built on their assumption, and we must explain how we know two things to be harmonious or mutually exclusive or of undecided correlation.

An important insight or principle we may suggest at the outset is that **consistency is not something we apprehend – it is *in*consistency we apprehend; consistency is just the absence of inconsistency**. Thus, despite the polarities we have given the words, compatibility is something negative, whereas incompatibility is something positive. Everything seems harmonious to us, till we discern some conflict. We judge things consistent, so long as we have no logical insight of inconsistency between them. Thus, strictly speaking, inconsistency can be directly 'seen', whereas consistency is normally assumed till found lacking. In some cases, consistency is indirectly put in doubt, without some direct inconsistency having been found, so that an uncertainty arises.

Aristotle formulated his three 'laws' firstly with reference to percepts or concepts by stating them as 'A is A', 'A cannot be non-A' and 'Either A or non-A'. In a later stage, they are formulated with reference to propositions. As I argue extensively in *Future Logic*[55], these laws are not laws in the sense of a-priori principles or arbitrary axioms, as some have claimed, though they are self-evident in that to deny them is self-contradictory[56], but have to be regarded as given in their objects somehow. Psychologically, they are profound impulses (which may be ignored or followed), which make humans rational; ethically (in the ethics of knowledge gathering), they are

55 See *Future Logic*, chapters 2 and 20.
56 See *Future Logic*, chapter 31.

indispensable tools and imperatives to actively respond to certain epistemic situations in certain ways (though one can be dishonest or unaware and ignore the facts, or evasive or lazy and ignore the imperative).

Identity brings to mind the visual image and sensation of calm or attraction or a tendency to merge of two things (equation), contradiction that of conflict or repulsion or explosive collision between them (because they cannot occupy the same place), while exclusion of the middle refers to a gap or deficiency between them (raising doubts and awakening questions). These may be imaginative representations for philosophical discussion like here, but they are not always (if ever) involved in concrete identification of identity, contradiction or research needs. Their involvement is more technical or abstract, straddling as it were the experiential domain and the conceptual knowledge domain. Although formulated as a triad, the laws of thought are three aspects of essentially one and the same necessity.

The law of identity, simply put, tells us "what you see is what you get" – it is a mere acknowledgment that the data of phenomenal experience are the fundamental givens of any knowledge enterprise; that there is ultimately no other data to base inference on, so that all their details must be paid attention to and taken into consideration in any inference. With respect to its formulation as 'A is A', with reference to terms rather than propositions, this law would simply mean that, if we for instance compare the constituent points in any two material or mental complex phenomena, we have to acknowledge that wherever dots *appear* (or fail to appear) to us, we can definitively say that there *are* (or are not, respectively) dots (at least phenomenal dots) – at least for now, until if ever the situation changes or further scrutiny tends to belie the first observation (because many later observations supplant the first, by their statistical weight).

Identity is a law, because there is no other way to conceive things – *at this phenomenal level to 'seem' is to 'be'*. You can deny your phenomenon's reality, but not its very occurrence or existence. If you try to deny your actual phenomenon by *immediately* hypothesizing some invisible conflicting 'phenomenon' behind it (a noumenon, to use Kant's word), you

are condemned to being basically unempirical and therefore without epistemological justification for your own act. You have nothing to show for your case, since by definition you appeal to the *un*seen, *whereas you must acknowledge the seen as seen to at all deny it*. The baselessness and circularity of such refusal to accept the phenomenon (*as* a phenomenon, no more, at least) merely reflects that the phenomenon experienced is the given to deal with in the first place (for this reason any denial of it is bound to admit it, implicitly and explicitly by referring to it). All such argumentation is of course very conceptual, and so only at best lately and peripherally significant in any actual act of acceptance of the phenomenon as such.

Phenomenologically, the law of identity means that an image of a material entity, mentally projected externally onto that entity, does not blank out the entity (being as it were in a parallel space, transparent). When such mental image seemingly shares outer space with the material body it is projected on, then the phenomenon as a whole has changed, though the material entity stays on (perseveres as an appearance), having been *augmented* in respect of a mental image. That is, the new phenomenon is enlarged (by an additional image) in comparison to the originally given phenomenon. This means that postulation of a noumenon merely adds a mental component (including additional phenomena) to the first presented phenomenon, and does not succeed in erasing the first phenomenon, precisely because it is introduced *in relation to* the first phenomenon (specifically, as an attempt to explain it or explain it away).

The law of identity is an impulse, a call to empiricism, which we normally obey without doubt or question. It acknowledges that appearances might in the long run change or prove misleading, taking into consideration all other appearances. It does not deny, nor accept *ab initio*, that behind the seen appearance there might be unseen or invisible events or things; but such outcome can only be arrived at through an overall consideration of all experiences and much pondering. That is, 'noumena' might well exist beyond a given field of phenomena – but they would have to be end products of an evaluative process and could not be first assumptions. Since evoking noumena does not in itself annul phenomena (merely adding more phenomena to them), the

questions inherent in phenomena and their apparition to us remain unanswered.

The reason why the thesis of noumena seems at first sight credible, is that we have experience of different sense-modalities, each implying that the others are *incomplete*, and we have memory of changes in our experience and/or its interpretation *over time*, so that our conceptual knowledge (or its suppositions) has naturally come to conclusions that '*things are not quite or always what they seem*'. But in such case, the term noumenon is trivially but another name for abstracts or concepts. In Kant's coinage and use of the term, however, the noumenon is not a hidden extension of the phenomenon, but purports to discard and replace the phenomenon altogether. The noumenon is by definition unknowable (universally) – though Kantians never tell us how come *they* themselves have the privilege to even know enough *about* it to know that it exists and is unknowable! The correct statement would rather be that noumena (i.e. less abstrusely, abstracts, concepts) are not concrete experiences, but merely logically assumed derivatives of percepts. They are hoped to be ontologically 'more real' than percepts, digging deeper into reality than the visible surface of things (to which we are supposedly restricted somewhat by the limited range of sense-modalities open to cognition), even as they are epistemologically admitted to be less reliable.

The laws of non-contradiction and of the excluded middle are intertwined with that of identity, as evident in the arguments above. But how do we know that 'A is not non-A' or that it is either-or between them? Consider our basic dot of light or its absence (darkness) in the visual field – such a dot is evidently never in contradiction with itself. We never simultaneously perceive a dot and not-perceive it – in any given place we mentally chose to focus on, there either appears or does not appear a lighted (or dark) dot. At this level, where the object is reduced to a single character (light) and precise place (the smallest possible size), we cannot *honestly, sincerely* answer 'yes and no' or 'neither yes nor no' to the question. It is there, or it is not. If it seems there, it is. If it does not seem there, it is not. We cannot even pretend we don't see what we see – at least not

in words, for we would have to acknowledge their meanings, and therefore the actual phenomenon.

These laws are indeed *in* the phenomenal world, insofar as positively no phenomena ever appear in contradiction or as neither-nor, i.e. by *absence* of empirical evidence to the contrary. They are in, because their negations are *not* in. But they relate to mind, inasmuch as when a dot A appears, and we start speaking of the unseen non-A, *we are in fact imagining non-A in our heads*, and so bring a new (mental) element into the picture. By the law of identity, this non-A phenomenon (which is mental) must be distinguished from its alleged opposite A (the given, which may or may not be mental), and admitted as an *addition* in the experiential field. But it remains true that A and non-A themselves are not in fact coexisting or both absent in the field – rather what we experience is coexistence of the given A with a *projected* non-A.

The law of contradiction does not deny the possibility that two *different* things might coexist, like a dot of light and the imagination (or memory) of absence of such dot of light; such things are merely contrary. The law of the excluded middle does not deny the possibility for something and *the idea of* its absence to be both absent from a field of experience; in such case, we can still suppose, as we indeed *see* as experience, that the thing itself is absent (even though the idea of its absence is allegedly absent – until mentioned as absent, that is!)[57]. Thus, these laws are

57 Our minds seem so made that, indeed, we might consider that we always *think* non-A when we *see* A. This is not a mere perversion of the mind, it is rather an expression of the fact that concept-formation involves not only reference to perceived similarities between two objects, but also to perceived *dissimilarities* between other objects and them. Thus, in order to classify something as A, we must simultaneously declassify it from non-A. That is, the *thought* of A automatically calls forth the *thought* of non-A, for purposes of distinction. It is not that A per se implies non-A (though in most cases, A in one thing implies non-A in others, otherwise neither A nor non-A would be distinguishable in the first place), rather it is that A cannot be fully delimited or understood without bringing to mind non-A as a possible alternative (except perhaps ‘non-existence’ – though in that ultimate case, we can say that the term is merely verbal, without conceivable concrete referent).

empirical, in the sense that they do not impose anything on the phenomenon, but accept it as is. They merely push *the observer* back into the fold of experience, should he venture to stray. They do not involve a modification or manipulation of the phenomenon; but on the contrary, they make the observer openly and carefully *attentive to* what is phenomenal. They involve a distinction between primary phenomena (be they 'material' or 'mental'), as given *ab initio*, and imaginary alleged representations (ideas, mental phenomena) of eventual phenomena, which merely introduce additional phenomena.

It is very important to emphasize again that **negation is a logical act**. It is never a pure experience, but always involves conceptual interference by the Subject. In formal logic, terms like A and non-A are neutral and formally indistinguishable. That is, they function in interchangeable ways, so that the negation of non-A (non-non-A) is technically equivalent to A (by obversion); and we might label non-A as 'B' and A as 'non-B' without affecting inferential processes. But at the phenomenological level, these labels are quite distinct. Something appearing would be labeled positively (say, A), whereas something not-appearing would be labeled negatively (as non-A).

What we here labeled A is a phenomenon or percept. What we here labeled non-A is *not* apparent per se, but only effectively 'apparent' in that *A* did not appear. Non-A signifies that we have *asked a question* 'is A there (i.e. in the phenomenal field)?' *and after further scrutiny answered it* by 'no, I do not find it there'. The former (presence) is *directly* known, the latter (absence) is *indirectly* known through a mental projection (*imagining* A, i.e. inventing it or remembering it from previous perceptions) coupled with an experimental search (whose result is unsuccessful). Clearly these are very different cognitions – one being purely passive and empirical, the other involving an active inquiry and referring to observation only by the failure to

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Furthermore, concepts formed by negation (like darkness) presuppose some relatively positive phenomena (like light), whose absence they express, having been conceived first.

confirm an anticipated equivalent of one's imagination. The later is useful and informative, but it is a construct.

Negative concepts or statements are thus never strictly-speaking empirical, and negation is a fundamental building block *of reason*. A negation is at the outset, by its very *definition* when introduced by the Subject as a cognitive artifice, logically contradictory to something. It cannot then be said *empirically* that both percepts A and non-A occur (since saying I 'see' non-A in the present field of perception just means I looked for and did not see A in it), nor that neither A nor non-A occur (since if I look and do not see A in the present field of perception, I would conclude non-A for it – though I may remain open-minded about other eventual fields of perception containing A)[58]. A negative concept or statement is therefore fundamentally different from a positive one, and can at best only indirectly ever be characterized as 'empirical'.

The three laws of thought are logical primaries, involved in all discourse about any phenomenon (and similarly relative to intuitive data, and at a later stage with respect to conceptual discourse itself). They jointly operate in identical ways in every observation, pushing us to admit what we see (identity), not to contradict what we see (non-contradiction), and not to ignore and add possibilities to what we see (exclusion of a middle). To fail to apply them is simply to confuse the given data with additional mental ingredients (fantasies), which neurotically either deny the evidence (mentally replacing it with its contradiction) or question it (by mentally proposing a 'middle' term). These laws can be stated as propositions, but they nevertheless have no conceivable alternatives. Any doctrine proposed has to be reconciled with experience somehow, since

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58 Of course, at a conceptual level, i.e. when dealing with abstracts, we may encounter contradictions (i.e. both A and non-A seeming true) and doubts (i.e. neither A nor non-A seeming true). Here, both the positive and negative concepts are mental constructs, and so there is no guarantee that the issue can immediately be resolved by one look. That is of course where the whole science of logic comes into play; it is needed to deal with just such issues with reference to a plurality of experiences.

all discourse is a reaction to experience, an attempt to solve the mystery it presents, so merely ignoring experience does not qualify as reconciliation.

In that sense, it is accurate to say that these laws are laws of thought; they are laws *for* the mind (the observer). We may say that something is A and not A, or neither A nor not A. But these words have no meaning *in* experience, no phenomenal referents. They are just words, sounds or drawings that signify nothing, not even an imaginable circumstance. The way we 'imagine' them is to stupidly or deliberately confuse a thing and an image of a thing, and project the idea of non-A (instead of non-A itself) next to A (or next to the idea of A) or some such artifice. In other words, the propositions claiming to deny the laws of thought have only a superficial meaningfulness and credibility, due to in fact having referents (ideas) *other than* those they pretend to have (things). With regard to the original objects of perception, they are in fact silent.

Note well that application or obedience the laws of thought does not involve an imaginative act (a volition); it is on the contrary attempts to ignore or deny them which do, requiring interference of the observer's imagination in the cognitive process (preempting experience). That is, the laws of thought themselves are objective, it is only their denials that are subjective (in the pejorative sense). The laws of thought thus remain empirically, and epistemically, and therefore epistemologically, undeniable. So much with regard to applications of the laws of thought to perceptual evidence.

With regard to concepts (which derive from comparisons and contrasts, or from subsequent imaginations recombining such concepts) and propositions (imaginations of relations between concepts), they remain always open to doubt, hypothetical, so long as equally credible alternatives are imaginable. Credibility is found in everything experienced or thought, it is merely admittance that such and such has been experienced or thought (thought being a sort of experience, though mental). *Ab initio*, any two concepts or propositions are *compatible*, having both been thought. Incompatibility is a later judgment, which follows realization that the concept or proposition somehow directly or

indirectly contradicts experiential evidence or leads to internal inconsistency in knowledge or is inherently self-contradictory.[59]

If two such ideas or thoughts are found or not found to be in utter conflict, they both retain the minimal credibility of being at least *imaginable*, at least till one or both of them is found incoherent with some experience(s) or for some reason unimaginable. If for some reason they are considered to be in conflict, they separately retain some credibility, though their interaction raises a doubt and it is understood that we have to ultimately eliminate at least one of them, removing its temporary credibility with reference to further experiences or abstract considerations. During the phase of doubt, we may refer to their frequencies of confirmation in experience, and regard one as more credible (or likely or probable) than the other.

The job of Logic is, note well, not to *exclude* as much as possible, but to find ways to *include* as much as possible, so that all opinions and points of view (which all have some basis and so represent some kind of experience) are accounted for and explained or explained away. Logic is thus not merely, as some contend, search for *contradictions,* but (this in order to) search for *harmonizations*.

3. Words and Intentions

Words are sounds, sights or touch[60] symbols that conventionally refer to phenomena, intuitions and abstracts. As sounds, sights, etc. per se, words are of course themselves phenomena, which can be expressed either materially or mentally as outer or inner speech or writing, being used for personal thought and memory or social communication and knowledge accumulation. Many words have rich natural and historical roots, but they are

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59 We consider concepts or propositions compatible until and unless we find some incompatibility between them. As I already pointed out in *Future Logic*, in opposition to the claims of certain modern logicians, we do not ‘prove consistency’ but rather ‘find inconsistencies’.

60 For instance, blind people use touchable words (Braille); certain pre-Columbian peoples used knots in rope as words.

nonetheless conventional (i.e. arbitrarily chosen), in that they can always be changed at will by consent. Also note, the equations between word-sounds and word-sights (and likewise, felt-words) are also conventional[61].

Words evidently differ from language to language, from one population group to another. A language is a collection of words (vocabulary) used by someone or some group, in accordance with certain accepted rules (grammar). Words, for old or new things, are almost daily coined and adopted by individuals, social groups and societies. Whoever coins a word, for whatever purpose, must *intend* (chose, convene) some more or less stable signification for it. Without such an *intuitive* understanding, words cannot have any semantic content.

Words are not mere phenomena, but refer to things; i.e. these auditory, visual or touch phenomena are signs for things (phenomena, intuitions and abstracts) other than themselves. Whether the things they refer to are real or illusory, clear or vague, is not logically relevant to the fact of signification. Signification is a relation, one of equation of sorts, saying (i.e. intending, to repeat) ‘when I mention this word, please think of this thing’. Words are labels, they have meaning. There are wordless thoughts; indeed, most of thought is wordless. In the case of wordless thought, one is conscious of the meaning without use of the label.

Indeed, it is ultimately impossible to understand, use or discuss words without appealing to wordless thoughts. If (as some philosophers claim) words obtained their meanings only by equations to other *words*, there would be need for an infinity of words; and since that is not possible (language is limited in size, and anyway man has no time for infinite regression), the most basic of words, from which all others derive, would be meaningless; and thus, *all* words would be meaningless. But to claim (in words) that ‘words are all meaningless’ or that ‘words refer only to other words’ is self-contradictory, since such claim

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61 Thus, e.g. the sound of ‘Avi’ and the written letters A-v-i have no relation other than what we have convened for them, though that convention has a rich history that we will not needlessly ignore.

itself purports to have understandable and communicable meaning. Such claim is thus not a consistent thesis, and can be rejected once and for all[62]. Therefore, it is logically self-evident that some words are meaningful, and that as well as words with explicit meanings, there are wordless implicit meanings.

The meanings of words, as we said, may be phenomenal objects (e.g. 'Avi' refers to an individual physical person, but also 'person' refers to all persons), intuitive objects (e.g. 'I' or 'I want') or abstract objects (e.g. 'personhood' or 'wanting'). But moreover, more importantly, ***every word implies an intuition*** – the **intention** that the word concerned be associated with such and such a meaning being itself an intuitive object. We intend the meaning of a word, not only the first time, when we coin it or learn it, but every time thereafter, whenever we use it. Without such intention, the word remains a mere noise or shape, devoid of meaning for us. Words in themselves are inert; it is our intentions that give them life and power.

Each of us knows (in the way of self-knowledge, intuition) what he means by the words he uses at a given time, whether clearly or vaguely (and whether correctly or erroneously according to previously accepted conventions). This is evident in the fact that *when we think or communicate, we do not and do not need to explicitly list out all the words in our language and map all their proposed interrelations*; thus, our discourse at any given time is mostly wordless and the words we do use at the time concerned must be admitted to be ultimately wordlessly intended to refer to certain things, whatever they be.

It is therefore incontrovertible that we have self-knowledge of our intentions, with regard to words at least – i.e. the fact of

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62 Similarly, the claim that words are mere conventions implies that 'knowledge is conventional' is confused. First, because that proposition, as a factual assertion, claims to know something beyond convention about knowledge; whereas applied to itself, it denies the possibility of non-conventional knowledge. But furthermore, all conventions imply factual knowledge: you have to know *that* there is a convention and *what* that convention is supposed to be and *how* to apply it correctly! You cannot have a convention about a convention… *ad infinitum* – it has to stop somewhere factual.

intuition is unavoidably implied at least by the fact of language. This is an interesting and important *rational proof of the existence and knowability of at least some intuitive objects* (objects of self-knowledge), incidentally. We can confidently say that intuitive objects exist, as any attempted discourse to deny them meaningfully itself logically implies intentions (as to the meanings of the words used) and therefore (some) intuitive objects. Thus, the postulate that there are intuitive objects is not an arbitrary claim, but a hypothesis for which we have found empirical (concrete) confirmation in the fact of language and its rational (abstract) implications.

Putting our ideas (terms, propositions, arguments) into words is called **verbalization**. Regarding the meaningfulness of words, what misleads many skeptical philosophers is the observation that words often have uncertain, vague and variable meanings. Starting from the assumption that words have to have real, precise and unchanging meanings to be at all meaningful, they conclude that words are otherwise meaningless. But this is a mistaken view, based on the misapprehension of word-meaning as equivalent to *definition* (by means of other words, as above described) and on a model of knowledge as a closed-circuit and static body of (verbal) information.

In truth, as careful observation of our actual behavior reveals, knowledge acquisition is gradual and adaptive. Our experience is cumulative and our rational reaction to it is a developing and evolving thing. There is no single item or total body of knowledge that stands alone and final; and the interrelationships between items, including the rules of interrelation, are always subject to review and revision. Knowledge is inevitably *contextual*, implying an unending trial and error process. It is not (verbal) definition that gives meaning to words; definition is only *an attempt to put into words* and delineate what we *already* wordlessly intend. A definition is like any other proposition subject to empirical, intuitive and rational checks and balances. It is an inductive product, not a deductive preliminary.

When we come across a new appearance (be it phenomenal, intuitive or abstract), we may find fit to label 'it' for purposes of memory and further discourse. What we mean by 'it' (a physically, mentally, intuitively or verbally indicated, i.e.

pointed-to, object, a ‘this’) is always tentative and open-ended. As we proceed further, thanks to new experiences and reasoning, this intended meaning may become firmer or shift or even entirely dissolve. First, ‘it’ may seem clearly understood; then we come across new phenomena or have new thoughts which make us realize that the initial intention is uncertain or unclear and we have to adjust our focus, and make further differentiations so as to pin-point more precisely what we ‘really’ intended by it; and so on, successively. Sometimes the intention remains unchanged, but our initial verbal definition (if any) may turn out to be inaccurate (too broad or narrow or otherwise inappropriate) and require modification. In some cases, we come to the conclusion that there was no need for a new word, and either abandon it or accept it as a mere synonym. In some cases, we realize that the term was already assigned to some other object, and keep it mind that it is a homonym.

Words are primarily intended to express (assumed) facts, but they may also be used – inadvertently as well as consciously – to signify fictions. We are quite able to distinguish a sensory phenomenon from an imaginary one without demonstrated sensory equivalent, and register the names for each with appropriate caveats. The intended object of a word may at first be thought real (as all appearances tend to be), and then after further information and reflection (which sometimes stretches over centuries), be found illusory. In such cases, the word may be dropped altogether – or kept for historical or literary purposes *with the understanding that* what it refers to is fictional (e.g. ‘unicorn’). These observations in no way justify a general condemnation of verbalization, but are events we take in stride without difficulty.

4. A Theory of Universals

‘**Universals**’ (a venerable philosophical term) is another word for abstracts, referring firstly to the presumed something underlying identifications of distinct sameness (e.g. the

squareness of two square objects[63]), and at a later stage to whatever may lie behind more complex products of conception (involving imagination as well as logic); that is, all the end-results of interpretation, of reasoning about the perceived outer and inner world[64]. Furthermore, we assume that there are also objects of intuition (i.e. self-knowledge)[65], and these may also be compared and reasoned-about, and give rise to concepts.

We can safely assume that, in some cases at least, universals/abstracts/concepts have an ontological significance, and are not merely mental constructs *referring to nothing beyond themselves*. For to deny *all* concepts such reality, is to deny truth and meaning to *one's own* assertion too, since that skeptical

63 Comparison involves two objects, as already stated. This does not mean that comparison is impossible with only one extended object under scrutiny, for we may be able to compare *parts* of that object together. We may, for instance, compare the sides and corners of a single square: the resulting concept is not the square figure as such, but concerns more specifically lines and angles. Even then, the concept is incomplete till we contrast other lines and angles.

64 I here count identification of sameness and difference in concretes, and of their conformity with the 'laws of thought', as among acts of reason (the first and simplest of them) in that they result in conceptual information. They are however so basic and relatively brief and devoid of process (direct) that they seem akin to perceptions. We could also, and often do, regard them as a distinct class of objects – objects of conceptual *insight*, as against 'conceptualization'.

65 I have note well excluded from this class, of objects of intuition, claims to direct knowledge of objects beyond oneself, e.g. claims to sensing ghosts or reading other people's thoughts. These claims must be regarded, *ab initio* at least, as pretentious. While it might eventually be demonstrated by experiment that some people do have such extrasensory cognitive powers in some circumstances (e.g. by finding what they predict as thought by others as reported always or usually true by the latter, although no physical means of communication between the two were possible), the need for careful demonstration remains in every case an epistemological necessity. We cannot naïvely accept such claims as valid without resulting chaos in knowledge; they must be viewed as *hypotheses to be confirmed by adductive means*. Most people who claim direct knowledge of spiritual, intuitive, mental or material events outside themselves are simply not aware of the inductive processes involved in thinking, and tend to take their first impressions for granted without verification procedures.

assertion itself is wholly composed of concepts. It follows that at least *some* concepts must be admitted as having a presence independent of any thought about them. (Precisely *which* concepts are to be admitted is what the science of Logic is all about.)

As to the nature of universals, my own theory (derived largely from modern physics and Buddhist ideas) would be that universals are, effectively, mathematical formulas. If I compare two waves, all the measurements I perform in doing so can be expressed by means of the algebra of coordinate geometry[66]. Such formulas, or rather ***the relative measures of the waves' features, motions and relations*** signified/implied by the formulas, are what we call 'universals'.

If the waves making up two particulars are wholly or partly equal or proportional, in respect of their varying shapes and sizes (length, amplitude), positions, trajectories (directions), speed, frequencies of conjunction or non-conjunction with others, then the particulars seem are 'similar' to us, and their common measures can be used to define concepts. Thus, universals (portions of waves, or of their histories) can be found in two or more particulars (full waves); and further abstracts can in turn be based on such abstracts (in the way of portions of portions of waves).

The magnitudes or degrees of the features, movements and interactions of waves (universals) are not the waves themselves (particulars), yet *the waves cannot exist without having measures*. We perceive the waves and we conceive the formulas[67], but both are in a sense equally there, apparent in the

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66 Here we of course have to go into detail regarding wave forms and mechanics.

67 I do not mean to say that every time we think a universal we construct a precise mathematical formula. Ordinarily, people rarely if ever revert to advanced mathematics! I merely imply that we tend to such a formula, in a vague and approximate way – i.e. that if the mass of mental measurements and comparisons in our minds were correctly summarized, they would amount to a certain formula. Ex post facto extrapolation from fragmentary observations and notes is thus involved, in speaking of a formula.

phenomenal object of experience. For this reason, even abstracts are sometimes regarded as quasi– or virtually experienced (thus broadening the term 'experience' to cover all appearances).

The waves and their measures *cannot be dissociated* within the field of experience, being respectively entities and attributes or behaviors of entities. What reason does to 'draw out' (abstract) the measures, is to focus on them while mentally ignoring the waves (or any images of or symbols for the waves). One cannot normally directly know the measure of a *single* object; one can only do so by considering and comparing a *plurality* of (two or more) objects. Even when the intuited self conceives of 'a self', although it has no direct experience of other selves, it refers to the many times it has intuited itself.

Thus, a universal can be said to transcend experience, yet be somewhat in it or immanent – it straddles experience. A universal is not in some metaphysical Platonic repository of Ideas, nor merely in the mind of its beholders (though it may also be there, when some external wave induces a like internal wave in a mind); it is inherent in every complex of wave-forms with the selected common mathematical characteristics.

This explanation is not intended as a mere metaphor– it need not be limited to imagined waves, but can be extended to all concrete existents. If light and gravity are waves, elementary particles are complicated bundles of such waves, sound is a wave (movements of air masses), and if the other sense-modalities are ultimately wave-like (as the electrochemical events associated to sensation suggest), then all material and mental phenomena, including living beings, may be said to be waves.

These waves all occur and travel and interact within a space and time as voluminous as the universe, conceivably as moving deformations of some primordial fabric (the stuff of 'existence')[68]. They vary in complexity, ranging from brief and

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68 Looking at a large body of water such as a lake, you can get a visual image or analogy of what a universe of waves would be. You see bubbles, ripples and waves in constant flux, appearing, moving around, disappearing; these seem individual, in that the sunlight allows us to mentally draw boundaries for them, but they are all just the movements

short events (unit waves, say) to the 3-D pulsations of quarks, photons, neutrinos, electrons or atoms, molecules, and to larger and larger collective wave motions of the later. Not just sights and sounds, but all sense-modalities, material or mental, including whole living organisms, are in this view varieties of wave or wave-motion formations.

And perhaps not only objective phenomena, but also subjective (i.e. intuited in/by the Subject) things and events might be supposed to have this fundamental wave character.

Wherever waves (particulars) appear, their measures (abstracts) are inherent in them. So, we can say that, although universals are not normally additional *extensions* in the experiential field (i.e. not themselves discernible wave events), they are still somehow present in it. They are normally only known through interpretative efforts (comparing and contrasting two or more waves). This theory of universals as mere measures of things assumes all things are reducible to wave activity (in some primordial substratum, perhaps – yet not an ether, somehow[69]).

In that case, the complex waves we call the **sensations** can well be construed as wave signals transmitted from one end of the sense organs via the spine and/or brain[70] over to their other end where the observer observes them. Similarly, **memories** may be supposed to be wave signals stored and sustained within the brain for occasional recall. That is, the senses transmit energy or fields onward to the Subject, from the 'outer' region of his experience, comprising his apparent body and its material surrounds. Memory may thereafter be produced, reverberating with the same vibration.

With this thesis, we are not forced to assume that the waves are distorted in transmission or storage, since our premise is that the terminal wave is a continuation of the initial wave. In such case,

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of one big entity; stir one place in the lake, and the motion is carried over to many or eventually (in diminishing degrees) all others.

69 In view of the Michelson-Morley experiment and its sequel, the Relativity theory (see further on).

70 Which was labeled the 'common sense' by Aristotle, as I recall. Meaning, the central sense.

the message received (by the observer) does not just *resemble* the original message (captured by the sense organ's receptors or stored in memory); it *is* the original message, which has vibrated through the senses, and possibly memory, to us without refraction. Assuming uniformity, the beginning and end waves are just the same object at a different time – a single traveling (wave) object. They may be of different *substance* (material, in whatever way, or even a mental product of material waves) and even magnitude (though with due proportions), but their *form* must remain the same. The universal is that form – the mathematical characteristics (including motions and interactions, as well as features) of the wave.

Thus, when I see or remember a bird, say, I can rightly consider that I am in *direct* contact with the bird; I am experiencing the waves emitted by the bird that reach over (via the senses, or memory) all the way to me the observer. The waves *are* the bird, the part of it that flows over into my body. This is not a mystical statement, but one quite physical. Any delimitation of the bird (or any object) in space and time elsewhere than at the very limits of its range of physical effects is arbitrary.[71]

In this view, then, the sense organs (themselves wave complexes, like all matter) are filters for particular classes of waves (fine light waves, gross sound waves, atomic wave bundles, electrochemical bundles of waves, whatever). Each sense organ is capable of receiving and passing on only specific wave-forms[72], leaving out all others; each specializes in a sense-

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71 A bird, of course, is a complex entity, involving not only light waves from its plumage, but other sense data, like its physiology, its movements and behavior patterns, its call, its smell, even its taste. It is through consideration of *all* information about a given bird, in the same and other sense-modalities, and its comparison to other birds and things, that we decide whether, say, a visual message (apparent bird-form) falls in the category of 'real' bird, or is merely a photograph or statue of a bird. Errors do occur, not because the visual message is ever wrong, but due to not taking into consideration all information currently available (or later available).

72 Although I say wave-form, I do not mean that sense-perception is perception of 'universals'. The wave the observer sees (via the sense organ concerned) is still concrete; it is not merely the *measurement* of

modality (or group of sense-modalities), insensitive to others. The eyes exclude sound waves, the ears ignore light-waves, etc.[73] These waves would be the same in form if they had been encountered immediately and not vibrated though the senses; the senses only isolate them from their context. Therefore, we may indeed not see all the waves out there[74], but those we do see we generally accept as equivalent, as mere continuations of the original disturbance in space and time.[75]

We should also in this context account for another kind of filtering, that of perceptible objects we do not care or take care to perceive. Thus, for example, I ordinarily do not pay attention to the glasses I am wearing or to the chair I am sitting on, and a mass of other sensations. I do not think such uninteresting items are ignored by the sense organs, because then we would not have

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the original wave (a 'universal' or formula or abstract) that is passed on, but the wave itself or a continuing echo of it (a concrete manifestation). I only mean to remind that the wave *has* a form, indeed a constant one.

73 This idea suggests that memory too is specific to the different sense-modalities; but it might also involve many sense modalities at once. As imagination is based on memory, it would be economical to store memories of complex sensory events in the various sense-modalities, so that they can be accessed separately in new combinations.

74 I cannot at this stage say just why filtering is necessary, however. A plausible explanation would be that a direct universal consciousness would be overwhelming somehow, driving the observer crazy by the multiplicity of messages. For evidently, digesting data *takes time*, we have to ponder the interrelationships between the items of our experience, and indeed think about the validity of our thinking processes. We all know from bitter experience that if too much information and thought is required at any moment, we become confused. The sense-filters therefore probably help us to sort and order incoming data for analysis and synthesis. Yet immediate universal consciousness is precisely what Enlightenment-seekers work for and claim possible. According to them, reliance on sense-perceptions is an aberration to be avoided, sense-data being but a veil over reality!

75 Such filtering may be considered not to occur in self-knowledge – there being no distance to travel between the observer and himself, or disturbances within himself (viewing here attitudes and volitions as waves or wave motions, perhaps within some distinct, 'spiritual' substance of the observer's soul), no senses are needed and the observer knows himself most directly.

the choice of perceiving them on occasion. Rather, I think we perceive them faintly, but discard the message, or allow it to enter memory subliminally, without giving it full conscious attention.

Similar comments can be made with regard to memory, note well. Once the sense-object has been perceived by the Subject, after relaying the waves concerned by sensory processes, the wave is stored (electrochemically, as neuroscientists teach us) in the brain. That is, we can well suppose, the wave *itself* is artificially made to *continue existing* in the way of some activity in the brain. Thus, in this view, the neurological 'imprint' is not a mere coded *symbol of* the original message, it *is* the original mathematical message. In such case, even while admitting that the message may occasionally be dampened, hard to recall or even lost, there is no need to figure out how come it (usually) stays the same. When we evoke a memory, or recognize a repetition of a sense-object previously encountered, we merely use the *ongoing* physical wave deep in the brain to produce a perceptible mental wave, identical in form to the stored one and to its sensory origin, projecting it (as an more or less vivid image) apparently inside our mind (for reminiscence) or outside it (for comparison to the new sense-object).[76]

What is true of memory of sensations is equally applicable to memory of abstracts based on such sensations, since as above postulated such abstracts are merely mathematical aspects of the wave-forms of the original sensations. Thus, we can understand without difficulty how abstracts are concretely stored in memory. As for mental projections (imaginations, perhaps feelings) and objects of intuition, and abstracts derived from them, supposedly they have allied physical vibrations in the brain (i.e. each of those thoughts has a specific physical effect,

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76 The best metaphor for memory, in my view, is that of an *echo chamber*. I imagine a sight or sound (or whatever) channeled into a brain cell and there allowed to rotate on and on (storage function), until we decide to peek into the cell and see or hear the vibration once more (recall function).

which therefore ‘corresponds’ to it), which may be stored in memory and recalled.

Some philosophers would object that the waves sensed or remembered may well, for all we know, change form as they tumble through the sense-channels, or within their memory storage. But in such case, we still have to appeal to the senses and memory to invalidate particular sensory or memory experiences – otherwise, how do we claim to know that error occurred? So, we can only logically suppose occasional distortion.

They could instead argue that the waves we experience are not as they seem end products of sensory processes, but independent events merely contiguous with them. But in such case, the impressions that we have a body, with a brain, spine and sense organs boiling with activity, would remain unexplained phenomena, leaving a gap or loose end in our understanding of the world experienced. To integrate all phenomena into our world-view, we need to include consideration of the phenomena we call the sense organs, etc., and suggest why they are there, what their role might be in the wider context of experience.

Thus, extreme skepticism is self-defeating, whether by inconsistency or by incompleteness. At first sight, the sensory and memory processes might be supposed refractive, producing an image very different from its origin[77]. We however cannot logically claim that this is definitely true, because such statement would require cognition of sense-objects without reliance on the senses, or of memory-objects without reliance on memory. The critic would be claiming special cognitive privileges not granted to the rest of us.

Our present account approaches the issues from another angle – phenomenologically. Start with the phenomenon *as a whole* as

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77 Note in passing that this skeptical thesis at least implicitly admits that internal objects (images) are correctly perceived by the Subject (within his mind), even if it claims them to be incorrect renditions of external objects by the sensory and brain organs. It has to do so, to have anything to discuss at all! Cognition as such is not in question, but only the assumed equation between different classes of objects.

given; the only issue at stake is then: what is the possible relation between these two aspects of it (the objects classed as external and those classed as mental-images produced by the senses or the brain)? In that case, we may assume that the senses and memory relay the information and do so without affecting it, with much less pretensions. For we only claim to *relate together* two factors (the material object allegedly sensed or remembered, and the subsequent sensory or memory processes presenting a mental image at the interface with the observer) which are *already* in the field of consciousness and accepted as existing (whereas the opposite view lays claim to things *outside* its own awareness by its own admission).

We are only attempting to explain the existing situation, that a process takes place through the senses during perception of physical matter or in the brain during its recognition – what is the role of these evident processes, we ask? If we assume there is *always* refraction, we are making a statement denying our experience of the matter at hand. But we may well, i.e. consistently, assume that *not all* sense or memory information is faithfully transmitted, so long as we can determine the matter by *some* other, more reliable sense-data (and, often, of memory-data). We thus prove that (some) sense and memory data is trustworthy.

We may wish to confirm sense evidence scientifically, by means of experiments showing that the information indeed stays the same from reception by the senses to presentation to the observer, in the way of a physically discernible persistent vibration, whatever its comparative size, depth or substance. Similarly, we could look for an ongoing physical vibration of some sort in the brain, before definitively concluding that memory is stocked as specific wave-forms. But the issue is really not empirical – it is logical (which means in practice that even if we don’t immediately find something, we have to keep looking).

Say we find no evidence of persistent wave-forms; we would alternatively look for fixed formulas that ‘translate’ the original wave in some regular manner, so that even if the final wave does not resemble it they can be correlated. Claiming codification of sense or memory data is not the same as claiming lawless refraction; for uniform refractive processes would simply

require that we ‘correct’ our world-view by ‘translation’, whereas random refraction (such that no correspondences whatever can be established) would leave us in confusion. But in the last analysis, even assumption of a regular code is not a viable theory, because it too ultimately makes contradictory claims, that matter is perceived and yet – because of sense or brain interference – is not perceived correctly (which means, not perceived period).

So, we must conclude, whatever experiment reveals, that ‘some sense and memory experience is valid’ is a logical truth. That is, no experiment being possible without this truth, none can belie it!

We do not need an epistemological ‘axiom’ to defend sensation and memory as universally reliable. It suffices to consider the products of these faculties as *true until and unless found false*. That is, the assumption of their essential correctness is an *inductive* principle, rather that a deductive credo. No artificial forcing of the issue is involved. Every event of sensation or memory is granted initial credibility, while remaining open to eventual sensations or memories that may put the preceding in doubt. When and if particular contradictions occur, they must be sorted out in accordance with normal logic.

It should be noted that the wave theory of universals proposed is the only coherent theory available. If we consider other proposals in the history of philosophy, we find them all to be logically flawed, and so in fact incapable of dealing adequately with the problem of universals. Thus, Plato’s Idealism, according to which the explanation of the common characters of different things experienced in our world are that they reflect certain transcendental “Ideas,” gives a wrong impression of solving the problem while in fact only sweeping it under the carpet. The Ideas existing in a higher world are only *less numerous* than the things in our lower world, but they are still a plurality with some common characters. In that case, what of *their* common characters, such as “transcendentalism,” “ideality,” or existence – are they in turn representatives of a single, unitary, top world? And how would this One Grand Idea break down into the Lesser Ideas?

A more immanent view of universals, which could be regarded as effectively the current "common-sense" view, would be that different primary *substances* are scattered throughout the universe and combine in different ways to produce the things we perceive through the senses. Alternative theories can be proposed as to what to regard as these material substances: they might be distinct *sensa* (i.e. units of sensed light, sound, etc.), or perhaps *qualities* (the minimum number required to construct things) rationally inferred from sense data. Some suggest instead that universals may be *mental* or *verbal* constructs – i.e. imaginations or subjective inventions or mere words in our heads. Whatever we construe them to be, the (material or mental) theories of universals as substances suffer from the same flaw as Plato's theory: we are still left with the need to explain a plurality (albeit a smaller one), and derive it from a unity (existence).

5. Unity in Plurality

The above 'wave' theory of universals, *granting* its premise that everything is ultimately reducible to 'waves', i.e. mobile vibrations in some sort of continuum, leads to the very radical conclusion that 'all things are one'.

The world as it appears to our touch-organs or to the naked eye – or even the eye aided by microscope or telescope – may give the impression that dimensionless points, lines or surfaces exist in nature, but as Physics has evolved it has become clearer that ***physical objects do not have precise corners, sides or facades – but fuzzy limits, arbitrarily defined*** by the visibility to our senses (specifically, sight and touch), aided or unaided, of concentrations of matter or energy.

For example, the tip of my penknife may seem like a sharp "point" to my touch or sight, but it is really – according to physical science (i.e. upon further investigation and reflection) – a rough, voluminous conglomerate of atoms, which are themselves complexes of smaller and smaller particles (electrons, protons and neutrons, seemingly some distance 'apart' from each other, etc.), which are themselves without

beginning or end being really vague clusters of waves. Similarly with regard to the cutting edge or flat sides of my penknife.

Indeed, if one takes these considerations to their extreme conclusion, one could say that ***no object has a beginning or end, every object stretches to the ends of the universe or to infinity***, and what we refer to as a specific individual object is merely the most humanly visible or concentrated part of that whole, which we arbitrarily or conventionally consider a separable unit (and habitually name, to solidify our viewpoint). So that ***ultimately, there are in fact no individual objects, but only ripples in the single object that is the universe as a whole***.

Where does an atom (or any other body) begin or end, granting that all consists of waves? If we see a star billions of miles away, on what basis do we say that the star ends over there, while the "light from the star" is here? Rather, we ought to say that the light we see is *part of* the star, i.e. that it extends all the way to us (at and through our visual sense organs, and on to our memory) and beyond. At what distance from the star do the gases or the light it emits cease to 'belong' to it, and are to be considered as 'separate' bodies? ***The cut-off point can only be arbitrary, i.e. mere convention.*** Gravity operates at astronomical distances. What objective ground do we have for distinguishing a field from its apparent origin? Furthermore, stars are in constant flux, arising in time and disappearing in time. At what point in time (as well as space) may we claim that the matter and energy we now call a star is 'not yet' or 'no longer' a star? Surely, the quarks from which the star emerged were already 'the star' and when the star bursts or is absorbed into a black hole it is still 'the star'. We ourselves are stardust – does that mean that the stars in question *became* us, or that *being* a star – from the beginning of time to its end – includes eventual human forms?

In this view, ***every entity in the universe stretches out with every other to fill the whole space and time of the universe***! And if we say this, we might as well say – without any mystical intent, though in agreement with Buddhist mystics – that all things are one. There are just *more intense concentrations* of matter or energy here and there, now and then, in *one continuous* field, but nowhere dividing lines. Because ***we perceive only fractions of***

the totality, only the aspects involving the sense-modalities, we isolate small blobs of the whole as individual phenomena. All phenomena perceived are centers of complex wave activities in the universal fabric; *We* 'individuate' phenomena *with reference to the sense-modalities they exhibit which are accessible to our senses*. We regard as delimiting an individual object in space and time such perceivable *fraction* (visible to the senses) of the wave activity stretching to the ends of the universe – ignoring its larger invisible extensions, later induced by reason. Thus, ***all individuation is fantasy*** (this can be known by rational considerations, as here), ***reinforced by naming*** (itself a sense-modality phenomenon, by the way). In which case, strictly speaking, ***nothing is divisible at all***.

That would seem to be a correct view of our physical world in the context of present knowledge – the hypothesis most consistent with experience, experiment and current scientific theorizing. We thus, provided we anticipate the results of Physics and claim that some sort of unified field theory is sure to be established, and provided we stretch that assumption to include wave explanations of the mental and spiritual domains, arrive at a concept of the world as 'unity in plurality' – a harmonious marriage of the philosophies of Pluralism and Monism. Heraclitus was right – everything is ultimately motion (i.e. waves) and Parmenides was right too – everything is ultimately one thing (i.e. the medium subject to waves).

We could even view this conclusion as a justification of the Buddhist view that "all things are empty!" For instance, the message of *The Diamond Sutra* seems to be that all objects material or spiritual are *infinite* vortices with no beginning and no end. They are neither categorical as they seem; nor can they be surely declared hypothetical, being delimited merely by our naming of them, but having no sure limits in themselves so far as we know so that they are therefore effectively boundless.

We have already, inspired by Buddhist doctrine, concurred with them that individuation is a man-made artifice. But even granting that we might legitimately, out of mere convenience, focus on specific places and durations of the universe, because a disturbance 'stands-out' there and then in relation to our senses – we are still left with the question as to *what* it is that is

disturbed? What is *the medium* or substratum of all wave motions? We are tempted to view it as a stuff and call it "existence," or like Descartes call it "the ether." The problem is that since the Michelson-Morley experiment on the velocity of light such a substance underlying waves has apparently been discredited. These physicists measured the velocity of light in the same direction as our planet's motion and in the opposite direction. To everyone's surprise, they found the velocity identical either way. This was eventually explained by Albert Einstein as indicative that there is no absolutely stationary substratum or "ether" relative to which wave motions occur, and he built his famous theory of Relativity as an alternative world-view (such that space and time coordinates are depend on the velocity of the observer relative to what he measures).

Thus, although when we think of waves, and mathematically work out their motions and interactions, we regard them as disturbances within some medium, it turns out that there is no such medium according to experimental indices! On this basis, we can agree with Buddhist philosophers that (surprisingly, incomprehensibly) *nothing* is being waved – i.e. that the ultimate nature of "existence" is "emptiness." And there is no need of high meditation or mystical insight to arrive at this conclusion – it is seemingly justified by ordinary experience and reason (scientific experiment and theory).

22. Logical Activities

Drawn from Phenomenology (2003), Chapter 7:3,1-2,4,6.

1. Logical Attitudes

Logic is usually presented for study as a static description and prescription of forms of proposition and arguments, so that we forget that it is essentially an *activity*, a psychic act. Even the three Laws of Thought have to be looked at in this perspective, to be fully understood. To each one of them, there corresponds a certain mental attitude, policy or process…

To the Law of Identity, corresponds the attitude of **acknowledgement of fact**, i.e. of whatever happens to be fact in the given context. Here, the term 'fact' is meant broadly to include the fact of appearance, the fact of reality or illusion, or even the fact of ignorance or uncertainty. Also, the attention to eventual conflicts (contradictions, incompatibilities, paradoxes, tensions) and gaps (questions, mysteries); and by extension, other forms of oppositional relations.

To the Law of Non-contradiction, corresponds the policy of **rejection of contradictions**. Contradictions occur in our knowledge through errors of processing of some kind (e.g. over-generalization, uncontrolled adduction, unsuccessful guessing), which is ultimately due to the gradual presentation of information to the human observer and to his limited, inductive cognitive means. The Law is an insight that such occurrence, once clearly realized, is to be regarded not as a confirmation that contradiction can occur in reality, but as a signal that a mere illusion is taking place that must be rejected.

To the Law of the Excluded Middle, corresponds the process of **searching for gaps or conflicts in knowledge and pursuing their resolution**. This is the most dynamic cognitive activity, an important engine in the development of knowledge. And when a contradiction or even an uncertainty arises, it is this impulse of the human thinking apparatus that acts to ask and answer the

implicit questions, so as to maintain a healthy harmony in one's knowledge.

Thus, the exercise of logic depends very much on the ***human will***, to adopt an attitude of factualism and resolve to check for consistency, look for further information and issues, and correct any errors found. The psychological result of such positive practices, coupled with opportunity and creativity, is increasing knowledge and clarity. The contraries of the above are avoidance or evasion of fact, acceptance of contradictions, and stupidity and laziness. The overall result of such illogical practices is ignorance and confusion.

Whereas 'consciousness' refers to the essentially static manifestation of a Subject-Object relation, 'thought' is an activity with an aim (knowledge and decision-making). The responsibility of the thinker for his thought processes exists not only at the fundamental level of the three Laws, but at every level of detail, in every cognitive act. Reasoning is never mechanical. To see what goes on around us, we must turn our heads and focus our eyes. To form a concept or formulate a proposition or construct an argument or make an experiment or test a hypothesis, we have to make an effort. The more attentive and careful our cognitive efforts, the more successful they are likely to be.

2. Principles of Adduction[78]

The concepts and processes of adduction are fundamental tools of human cognition, which only started becoming clear in recent centuries thanks to philosophers like Francis Bacon or Karl Popper. Even so, many people are still today not aware of this important branch of logic. Logic is the art and science of discourse. Like all logical principles, those of adduction are firstly idealized descriptions of ordinary thinking, and thereafter prescriptions for scientific thought.

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78 This essay was written back in 1990, soon after I completed *Future Logic*, so that I could not include its clarifications in that book. All the other topics in this chapter were developed later, in 1997.

Anything we believe or wonder about or disbelieve may be considered a *theory*. Everything thinkable has some initial credibility at first glance, but we are for this very reason required to further evaluate it, otherwise contradictories would be equally true! ***Adduction*** is the science of such evaluation: it tells us how we do and should add further credibility to a theory or its negation. To adduce evidence is to add logical weight to an idea.

A theory T is said to ***predict*** something P, if T implies P (but does not imply nonP). A theory T may predict the negation of something, i.e. nonP; we might then say that T ***disclaims*** P; in such case, T implies nonP (but does not imply P). A theory T may not-predict P, or not-predict nonP, which are the same situation by our definition (i.e. where T does not imply P *and* does not imply nonP); we might then say that T is ***neutral*** to P (and to nonP).[79]

A theory T has always got at least one alternative nonT, at least to start with[80]. Normally, we do not have only one theory T and its negation nonT to consider, but many theories T1, T2, T3, etc. If any of these alternatives are compatible, they are improperly formulated. Properly formulated alternatives are not merely distinct but incompatible[81]. Let us henceforth suppose we are dealing with such contraries or contradictories, so that the

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79 A theory that implies *both* P and nonP is inconsistent and therefore false. If that result seems inappropriate, then the claim that T implies P or that T implies nonP or both must be reviewed.

80 This alternative is incompatible with it, i.e. they cannot both be true.

81 For example, 'it is white' and 'it is black' are too vague to be incompatible. We might not realize this immediately, till we remember that some things are both black and white, i.e. partly the one and partly the other. Then we would say more precisely 'it is white and not black' or 'it is wholly black', to facilitate subsequent testing. Of course, our knowledge that some things are both black and white is the product of previous experience; in formulating our theses accordingly, we merely short cut settled issues.

alternatives in the disjunction 'T1 or T2 or T3 or..'. are mutually exclusive[82].

Theories depend for their truth on *internal consistency and consistency with all other knowledge, both the theoretical and the empirical*. Here, we are concerned in particular with the estimating the truth, or falsehood, of theories with reference to their predictions or lack of them.

By ***correct*** (or true) prediction we mean that T predicts P and P indeed occurs, or that T disclaims P and nonP indeed occurs.

By ***incorrect*** (or false) prediction is meant that T predicts P whereas nonP is found to occur, or that T disclaims P whereas P is found to occur.

Ultimately, occurrences like P or nonP on which we base our judgments have to be mere *phenomena* – things which appear in our experience, simply as they appear[83].

If a theory seems true *at first sight*, it is presumably because its alternative(s) was or were quickly eliminated for some reason – for example, due to inconsistency, or because of obviously untenable predictions. If no alternative was even considered, then the first theory – *and its alternative(s)* – must be subjected to consistency checks and empirical ***tests***. By the latter term we refer to observation (which may be preceded by experiment) of concrete events (and eventually some of their abstract aspects), to settle issues raised by conflicting theories.

It is conceivable that only one theory concerning some issue be at all thinkable; but this situation must not be confused with that of having only succeeded in constructing one theory thus far. For it also happens that we have *no* theory for the issue at hand (at present and perhaps forever), and we do not conclude from this

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82 The disjunction 'T or nonT' may be viewed as a special case of this. But also, 'T1 or T2 or T3 or..'. may always be recast as 'T1 or nonT1', where nonT1 is equivalent to 'T2 or T3 or..'..

83 Such bare events impinge on our mind all the time. A skillful knower is one who has trained himself or herself to distinguish primary phenomena from later constructs involving them. Sometimes such distinction is only possible ex post facto, after discovery of erroneous consequences of past failures in this art.

that there is no explanation (we maintain that there is one, in principle). It must likewise be kept in mind that having two or more theories for something does not ensure that we have all the possible explanations. We may later (or never) find some additional alternative(s), which may indeed turn out to be more or the most credible.

Alternative theories may have some predictions in common; indeed, they necessarily do (if only in implying existence, consciousness and similar generalities). More significant are the differences between alternative theories: that one predicts what another disclaims, or that one predicts or disclaims what another is neutral to; because it is with reference to such differences, and empirical tests to resolve issues, that we can confirm, undermine, select, reject or establish theories.[84]

If a theory correctly predicts something, which at least one alternative theory was neutral to, then the first theory is somewhat ***confirmed***, i.e. it effectively gains some probability of being true (lost by some less successful alternative theory). If a theory is neutral to something that an alternative theory correctly predicted, then the first theory is somewhat ***undermined***, i.e. it effectively loses some probability of being true (gained by a more successful alternative theory). If all alternative theories equally predict an event or all are equally neutral to it, then each of the theories may be said to be ***unaffected*** by the occurrence.

Thus, confirmation is more than correct prediction and undermining more than neutrality. By our definitions, these terms are only applicable when alternative theories behave differently, i.e. when at least one makes a correct prediction and at least one is neutral to the occurrence concerned. If all alternatives behave uniformly in that respect, they are unaffected by the occurrence, i.e. their probability ratings are unchanged.

84 A prediction is only significant, useful to deciding between theories, if it is, as well as consistent, testable empirically; otherwise, it is just hot air, mere assertion, a cover or embellishment for speculations. The process of testing cannot rest content at some convenient stage, but must perpetually put ideas in question, to ensure ever greater credibility.

Thus, confirmation (strengthening) and undermining (weakening) are relative, depending on comparisons and contrasts between theories.[85]

Furthermore, we may refer to degrees of ***probability***, (a) according to which and how many theories are confirmed or undermined with regard to a given occurrence, and (b) according to the number of occurrences that affect our set of theories. If we count one 'point' per such occurrence, then (a) in each event the theory or theories confirmed share the point, i.e. participate in the increased probability, while that or those undermined get nothing; and (b) over many instances, we sum the shares obtained by each of the theories and thus determine their comparative weights (thus far in the research process). The theory with the most accumulated such points is the most probable, and therefore the one to be ***selected***.[86]

Note that it may happen that two alternative theories T and nonT, or a set of theories T1, T2, T3... are in equilibrium, because each theory is variously confirmed by some events and undermined by others, and at the end their accumulated points happen to be equal. This is a commonplace impasse, especially because in practice we rarely do or even can accurately assign and compute probability ratings as above suggested in the way of an ideal model. We end up often relying on ***'judgment calls'***, which people make with varying success. But of course, such decisions are only required when we have to take immediate action; if we are under no pressure, we do not have to make a stand one way or the other.

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85 Note that correct prediction by a theory does not imply proof of the theory (since 'T predicts P' does not imply 'nonT predicts nonP'), nor even exclude correct prediction by the contradictory theory (since 'nonT predicts P' is compatible). It 'confirms' the theory only if the contradictory theory may be 'undermined' (i.e. if 'nonT is neutral to P'), otherwise both the theory and its contradictory are unaffected.

86 The domain of probability rating may be further complicated by reference to different degrees of implication, instead of just to strict implication. T may 'probably imply' P, for instance, and this formal possibility gives rise to further nuances in the computation of probabilities of theories.

If any prediction of a theory is incorrect, then the theory is ***rejected***, i.e. to be abandoned and hopefully replaced, by another theory or a modified version of the same (which is, strictly speaking, another theory), as successful in its predictions as the previous yet without the same fault. The expression ‘trial and error’ refers to this process. Rejection is effective disproof, or as near to it as we can get empirically. It follows that if T incorrectly predicts P, then nonT is effectively proved[87]. So long as a theory seemingly makes no incorrect predictions, it is ***tolerated*** by the empirical evidence as a whole. A tolerated theory is simply not-rejected thus far, and would therefore be variously confirmed, undermined, unaffected.

A theory is finally ***established*** only if it was the only theory with a true prediction while all alternative theories made the very opposite prediction. In short, the established theory had an *exclusive* implication of the events concerned. Clearly, if nonT is rejected, then T is our only remaining choice; similarly, it all alternatives T2, T3... are rejected, then the leftover T1 is established[88]. We may then talk of inductive proof or vindication. Such proof remains convincing only insofar as we presume that our list of alternative theories is complete and their respective relations to their predictions correct, as well as that the test was indeed fully empirical and did not conceal certain untested theoretical assumptions. Proof is deductive only if the theory’s contradictory is self-contradictory, i.e. if the theory is self-evident.

Once a theory is selected on the basis of probabilities or established because it is the last to withstand all tests, it retains

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87 Note that if both T and nonT predict P, then P is bound to occur; i.e. if the implications are logically incontrovertible, then P is necessary. If we nonetheless find nonP to occur and thus our predictions false, we are faced with a paradox. To resolve it, we must verify our observation of nonP and our implications of P by both T and nonT. Inevitably, either the observation or one or both implications (or the assumptions that led us to them) will be found erroneous, by the law of non-contradiction.

88 At least temporarily; we may later find reason to eliminate T1, which would mean that our list of theories was not complete and a further alternative Tn must be formulated.

this favored status until, if ever, the situation changes, i.e. as new evidence appears or is found, or new predictions are made, or new theories are constructed.

It is important to note that, since new theories may enter the discussion late in the day, events which thus far had no effect on the relative probabilities of alternative theories or on a lone standing theory, may with the arrival on the scene of the additional player(s), become significant data. For that reason, in the case of selection, even though correct predictions or neutralities may previously have not resulted in further confirmations or undermining, they may suddenly be of revived interest[89]. Likewise, in the case of establishment, we have to continue keeping track of the theory's correct predictions or neutralities, for they may affect our judgments at a later stage.

Certain apparent deviations from the above principles must be mentioned and clarified:

Note that well-established (consistent and comparatively often-confirmed) large theories are sometimes treated as 'proofs' for narrower hypotheses. They are thus regarded as equivalent to empirical evidence in their force. This gives the appearance that 'reason' is on a par with experience with respect to evidence – but it is a false impression.

More specifically: say that (a) I guessed or 'intuited' the measure of so and so to be x, and (b) I calculated same to be x. Both (a) and (b) are 'theories', which can in fact be wrong, yet (a) being an *isolated* theory (or offhand guess) is considered confirmed or rejected by (b), because the latter being *broader in scope* (e.g. a mathematics theorem) would require much more and more complex work to be put in doubt.

The more complicated the consequences of rejecting an established hypothesis, the more careful we are about doing such a thing, preferring to put the pressure on weaker elements of our knowledge first.

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89 Thus, correct prediction, though not identical with confirmation, is 'potential' confirmation, etc.

Note also here the following epistemological fallacy: we often project an image, and then use this *imagined event as an empirical datum*, in support of larger hypotheses. In other words, speculations are layered: some are accepted as primary, and then used to 'justify' more removed, secondary speculations. By being so used repeatedly, the primary speculations are gradually given an appearance of solidity they do not deserve.

The term 'fact' is often misused or misunderstood. We must distinguish between theory-generated, relative fact and theory-supporting, absolute fact.

'Facts' may be implied by one's theory, in the sense of being predicted with the expectation that they will be found true, in which event the theory concerned would be buttressed. Such 'facts' are not yet established, or still have a low probability rating. We may call that ***supposed fact***. It is properly speaking an item within one's theory, one claimed to be distinguished by being empirically testable, one that at first glance is no less tentative than the theory that implied it.

In contrast, ***established fact*** refers to propositions that are already a source of credibility for the theory in question, being independently established. The logical relation of implication (theory to fact) is the same, but the role played by the alleged fact is different. Here, a relatively empirical/tested proposition actually adds credibility to a proposed theory.

3. Generalization is Justifiable

The law of generalization is a special case of adductive logic, one much misunderstood and maligned.

In *generalization*, we pass from a particular proposition (such as: *some* X are Y) to a general one (*all* X are Y). The terms involved in such case are already accepted, either because we have observed some instances (i.e. things that are X and things that are Y) or because in some preceding inferences or hypotheses these terms became part of our context. These terms already overlap to at least a partial extent, again either thanks to an observation (that some things are *both* X and Y) or by other means. The generalization proper only concerns the last lap, viz.

on the basis that some X are Y, accepting that *all* X are Y. There is no deductive certainty in this process; but it is inductively legitimate.

The general proposition is strictly speaking merely a hypothesis, like any other. It is not forever fixed; we can change our minds and, on the basis of new data (observed or inferred), come to the alternate conclusion that 'some X are not Y' – this would simply be *particularization*. Like any hypothesis, a generalization is subject to the checks and balances provided by the principles of adduction. The only thing that distinguishes this special case from others is that it deals with already granted terms in an already granted particular proposition, whereas adduction more broadly can be used to invent new terms, or to invent particular as well as general propositions. To criticize generalization by giving the impression that it is prejudicial and inflexible is to misrepresent it. We may generalize, provided we remain open-minded enough to particularize should our enlarged database require such correction.

Some criticize generalization because it allows us to make statements about *unobserved* instances. To understand the legitimacy of generalization, one should see that in moving from 'some X are Y' to 'all X are Y' one remains within the *same polarity* of relation (i.e. 'are', in this case); whereas if one made the opposite assumption, viz. that some of the remaining, unobserved instances of X are *not* (or might not be) Y, one would be introducing a much newer, less justified relation. So far, we have only encountered Xs that *are* Y, what justification do we have in supposing that there might be Xs that *are not* Y? The latter is more presumptive than assuming a continued uniformity of behavior.

Note this argument well. When we generalize from some to all X are Y, we *only* change the quantity involved. Whereas if, given that some X are Y, we supposed that some other X are also Y and some are not Y, we change *both* the quantity and the polarity, for we are not only speculating about the existence of X's that are *not* Y, but also saying something about *all* X (those known to be Y, those speculated to also be Y and those speculated to be not Y). Thus, the preference on principle of

particularization to generalization would be a more speculative posture.

Whence, generalization is to be recommended – until and unless we find reason to particularize. Of course, the degree of certainty of such process is proportional to how diligently we have searched for exceptions and not found any.

To those who might retort that an agnostic or problematic position about the unobserved cases would be preferable, we may reply as follows. To say that, is a suggestion that "man is unable to know generalities." But such a statement would be self-contradictory, since it is itself a claim to generality. How do these critics claim to have acquired knowledge of this very generality? Do they claim special privileges or powers for themselves? It logically follows that they implicitly admit that man (or some humans, themselves at least) can know some generalities, if only this one (that 'man can know some generalities'). Only this position is self-consistent, note well! If we admit some generality possible (in this case, generality known by the logic of paradoxes), then we can more readily in principle admit more of it (namely, by generalization), provided high standards of logic are maintained.

Moreover, if we admit that *quantitative* generalization is justifiable, we must admit in principle that *modal* generalization is so too, because they are exactly the same process used in slightly different contexts. Quantitative generalization is what we have just seen, the move from 'some X are Y' to 'all X are Y', i.e. from some instances of the subject X (having the predicate Y) to all instances of it. Modal generalization is the move from '(some or all) X are in *some* circumstances Y' to '(some or all) X are in *all* circumstances Y', i.e. from some circumstances in which the XY conjunction appears (potentiality) to all eventual surrounding circumstances (natural necessity). It is no different a process, save that the focus of attention is the frequency of circumstances instead of instances. We cannot argue against natural necessity, as David Hume tried, without arguing against generality. Such a skeptical position is in either case self-defeating, being itself a claim to general and necessary knowledge!

Note that the *arguments* proposed above in favor of the law of generalization are consistent with that law, but not to be viewed as an application of it. They are logical insights, proceeding from the forms taken by human thought. That is to say, while we induce the fact that conceptual knowledge consists of propositional forms with various characteristics (subject, copula, predicate; polarity, quantity, modality; categorical, conditional), the analysis of the implications on reasoning of such forms is a more deductive logical act.

Thus, generalization in all its forms, properly conceived and practiced, i.e. including particularization where appropriate, is fully justified as an inductive tool. It is one instrument in the arsenal of human cognition, a very widely used and essential one. Its validity in principle is undeniable, as our above arguments show.

4. Syllogism Adds to Knowledge

People generally associate logic with deduction, due perhaps to the historic weight of Aristotelian logic. But closer scrutiny shows that human discourse is largely inductive, with deduction as but one tool among others in the toolbox, albeit an essential one. This is evident even in the case of Aristotelian syllogism.

A classic criticism of syllogistic logic (by J. S. Mill and others) is that it is essentially circular argument, which adds nothing to knowledge, since (in the first figure) the conclusion is already presumed in the major premise. For example:

All men are mortal	(major premise)
Caius is a man	(minor premise)
therefore, Caius is mortal	(conclusion)

But this criticism paints a misleading picture of the role of the argument, due to the erroneous belief that universal propositions

are based on “complete enumeration” of cases[90]. Let us consider each of the three propositions in it.

Now, our major premise, being a universal proposition, may be either:

axiomatic, in the sense of self-evident proposition (one whose contradictory is self-contradictory, i.e. paradoxical), or

inductive, in the way of a generalization from particular observations or a hypothesis selected by adduction, or

deductive, in the sense of inferred by eduction or syllogism from one of the preceding.

If our major premise is (a), it is obviously not inferred from the minor premise or the conclusion. If (b), it is at best probable, and that probability could only be incrementally improved by the minor premise or conclusion. And if it is (c), its reliability depends on the probability of the premises in the preceding argument, which will reclassify it as (a) or (b).

Our minor premise, being a singular (or particular) proposition, may be either:

purely empirical, in the sense of evident by mere observation (such propositions have to underlie knowledge), or

inductive, i.e. involving not only observations but a more or less conscious complex of judgments that include some generalization and adduction, or

deductive, being inferred by eduction or syllogism from one of the preceding.

If our minor premise is (a), it is obviously not inferred from any other proposition. If (b), it is at best probable, and that

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90 In a way, Aristotle brought this criticism upon himself, since he first apparently suggested that universal propositions are based on complete enumeration. But of course, in practice we almost never (except in very artificial situations where we ourselves conventionally define a group as complete) encounter completely enumerable groups. Our concepts are normally open-ended, with a potentially “infinite” population that we can never even in theory hope to come across (since some of it may be in the past or future, or in some other solar system or galaxy)!

probability could only be incrementally improved by the conclusion. And if it is (c), its reliability depends on the probability of the premises in the preceding argument, which will reclassify it as (a) or (b).

It follows from this analysis that the putative conclusion was derived from the premises and was not used in constructing them. In case (a), the conclusion is as certain as the premises. In case (b), the putative conclusion may be viewed as a **prediction** derived from the inductions involved in the premises. The conclusion is in neither case the basis of either premise, contrary to the said critics. The premises were known temporally before the conclusion was known.

The deductive aspect of the argument is that granting the premises, the conclusion would follow. But the inductive aspect is that the conclusion is no more probable than the premises. Since the premises are inductive, the conclusion is so too, even though their relationship is deductive. The purpose of the argument is not to repeat information in the premises, but to verify that the premises are not too broad. The conclusion will be tested empirically; if it is confirmed, it will strengthen the premises, broaden their empirical basis; if it is rejected, it will cause rejection of one or both premise(s).

In our example, *conveniently, Caius couldn't be proved to be mortal, although apparently human, till he was dead. While he was alive, therefore, the generalization in the major premise couldn't be based on Caius' mortality. Rather, we could assume Caius mortal (with some probability – a high one in this instance) due to the credibility of the premises. When, finally, Caius died and was seen to die, he joined the ranks of people adductively confirming the major premise. He passed from the status of reasoned case to that of empirical case.*

Thus, the said modern criticism of syllogism (and by extension, other forms of "deductive" argument) is not justified. Syllogism is a deductive procedure all right, but it is usually used in the service of inductive activities. Without our ability to establish deductive relations between propositions, our inductive capabilities would be much reduced. All pursuit of knowledge is

induction; deduction is one link in the chain of the inductive process.

It should be noted that in addition to the above-mentioned processes involved in syllogism, we have to take into account yet deeper processes that are tacitly assumed in such argumentation. For instance, terms imply classification, which implies comparison, which mostly includes a problematic reliance on memory (insofar as past and present cases are compared), as well as perceptual and conceptual powers, and which ontologically raises the issue of universals. Or again, prediction often refers to future cases, and this raises philosophical questions, like the nature of time.

The approach adopted above may be categorized as more epistemological than purely logical. It was not sufficiently stressed in my *Future Logic*.

5. Concept Formation

Many philosophers give the impression that a concept is formed simply by pronouncing a clear definition and then considering what referents it applies to. This belief gives rise to misleading doctrines, like Kant's idea that definitions are arbitrary and tautologous. For this reason, it is important to understand more fully how concepts arise in practice[91]. There are in fact two ways concepts are formed:

Deductive concepts. Some concepts indeed start with reference to a selected attribute found to occur in some things (or invented, by mental conjunction of separately experienced attributes). The attribute defines the concept once and for all, after which we look around and verify what things it applies to (if any, in the case of inventions) and what things lack it. Such concepts might be labeled 'deductive', in that their definition is fixed. Of course, insofar as such concepts depend on experiential input

91 See also my *Future Logic*, chapter 4.4, and other comments on this topic scattered in my works. The present comments were written in 2002, so as to clarify the next section, about empty classes. The ultimate null class is, of course, 'non-existence'!

(observation of an attribute, or of the attributes imagined conjoined), they are not purely deductive.

Note in passing the distinction between deductive concepts based on some *observed* attribute(s), and those based on an *imagined* conjunction of observed attributes. The former necessarily have some real referents, whereas the latter may or not have referents. The imagined definition may turn out by observation or experiment to have been a good prediction; or nothing may ever be found that matches what it projects. Such fictions may of course have from the start been intended for fun, without expectation of concretization; but sometimes we do seriously look for corresponding entities (e.g. an elementary particle).

Inductive concepts. But there are other sorts of concepts, which develop more gradually and by insight. We observe a group of things that *seem* to have *something* in common, we know not immediately quite *what*. We first label the group of things with a distinct name, thus *conventionally* binding them together for further consideration. This name has certain referents, more or less recognizable by insight, but not yet a definition! Secondly, we look for the common attribute(s) that may be used as definition, so as to bind the referents together in our minds in a *factual* (not conventional, but natural) way. The latter is a trial and error, inductive process.

We begin it by more closely observing the specimens under consideration, in a bid to discern some of their attributes. One of these attributes, or a set of them, may then stand out as common to all the specimens, and be proposed as the group's definition. Later, this assumption may be found false, when a previously unnoticed specimen is taken into consideration, which intuitively fits into the group, but does not have the attribute(s) required to fit into the postulated definition. This may go on and on for quite a while, until we manage to pinpoint the precise attribute or cluster of attributes that can fulfill the role of definition.

I would say that the majority of concepts are inductive, rather that deductive. That is, they do not begin with a clear and fixed definition, but start with a vague notion and gradually tend

towards a clearer concept. It is important for philosophers and logicians to remember this fact.

6. Empty Classes

The concept of empty or null classes is very much a logical positivist construct. According to that school, you but have to 'define' a class, and you can leave to later determination the issue as to whether it has referents or is 'null'. The conceptual vector is divorced from the empirical vector.

What happens in practice is that an imaginary entity (or a complex of experience, logical insight and imagination) is classified without due notice of its imaginary aspect(s). A budding concept is prematurely packaged, one could say, or inadequately labeled. Had we paid a little more attention or made a few extra efforts of verification, we would have quickly noted the inadequacies or difficulties in the concept. We would not have 'defined' the concept so easily and clumsily in the first place, and thus not found it to be a 'null class'.

One ought not, or as little as possible, build up one's knowledge by the postulation of fanciful classes, to be later found 'empty' of referents. One should rather seek to examine one's concepts carefully from the start. Though of course in practice the task is rather to re-examine seemingly cut-and-dried concepts.

I am not saying that we do not have null classes in our cognitive processes. Quite the contrary, we have throughout history produced classes of imaginary entities later recognized as non-existent. Take 'Pegasus' – I presume some of the people who imagined this entity believed it existed or perhaps children do for a while. They had an image of a horse with wings, but eventually found it to be a myth.

However, as a myth, it survives, as a receptacle for thousands of symbolizations or playful associations, which perhaps have a function in the life of the mind. It is thus very difficult to call 'Pegasus' a null-class. Strictly speaking, it is, since there were never 'flying horses'. But in another sense, as the recipient of every time the word Pegasus is used, or the image of a flying horse is mentally referred to, it is not an empty class. It is full of

incidental 'entities', which are not flying horses but have to do with the names or images of the flying horse – events of consciousness which are rather grouped by a common symbol.

Mythical concepts in this sense are discussed by Michel Foucault in his *Order of Things*.

We can further buttress the non-emptiness of imaginary concepts by reminding ourselves that today's imaginations may tomorrow turn out to have been realistic. Or getting more philosophical we can still today imagine a scenario for ourselves, consistent with all experience and logical checks, in which 'Pegasus' has a place as a 'real' entity, or a concept with real referents. Perhaps one day, as a result of genetic manipulations.

Another example interesting to note is that of a born-blind person, who supposedly lacks even imaginary experience of sights, talking of shape or color. Such words are, for that person, purely null-classes, since not based on any idea, inner any more than outer, as to what they are intended to refer to, but on mere hearsay and mimicry. Here again, some surgical operation might conceivably give that person sight, at which time the words would acquire meaning.

But of course, there are many concepts in our minds, at all times, which are bound to be out of phase with the world around since we are cognitively limited anyway. It follows that the distinction here suggested, between direct reference and indirect (symbolic – verbal or pictorial) reference, must be viewed as having gradations, with seemingly direct or seemingly indirect in-betweens.

Furthermore, we can give the cognitive advice that one should avoid conceptualization practices that unnecessarily multiply null-classes (a sort of corollary of Ockham's Razor). Before 'defining' some new class, do a little research and reflection, it is a more efficient approach in the long run.

One should also endeavor to distinguish between **'realistic' concepts** and **'imaginary' concepts**, whenever possible, so that though the latter be null classes strictly speaking, their mentally subsisting elements, the indirect references, may be registered in a fitting manner. Of course, realistic concepts may later be found

imaginary and vice-versa; we must remain supple in such categorizations.

Imaginary concepts are distinguished as complexes involving not only perception and conception, but also *creativity*. The precise role of the latter faculty must be kept in mind. We must estimate the varying part played by projection in each concept over time. This, of course, is nothing new to logic, but a restatement for this particular context of something well known in general.

23. THE PARADIGM OF CAUSATION

Drawn from The Logic of Causation (I:1999-2000), Chapter 1.

1. Causation

Causality refers to causal relations, i.e. the relations between causes and effects. This generic term has various, more specific meanings. It may refer to **Causation**, which is *deterministic causality*; or to Volition, which is (roughly put) indeterministic causality; or to Influence, which concerns the interactions between causation and volition or between different volitions.

The term 'causality' may also be used to refer to causal issues: i.e. to negative as well as positive answers to the question "are these things causally related?" In the latter sense, negations of causality (in the positive sense) are also causality (in the broad sense). This allows us to consider Spontaneity (i.e. causelessness, the lack of any causation or volition) as among the 'causal' explanations of things.

A study of the field of causality must also include an investigation of non-causality in all its forms. For, as we shall see, even if we were to consider spontaneity impossible, the existence of causality in one form or other between things in general does not imply that any two things taken at random are necessarily causally related or causally related in a certain way. We need both positive and negative causal propositions to describe the relations between things.

In the present work, *The Logic of Causation*, we shall concentrate on causation, ignoring for now other forms of causality. Causative logic, or the logic of causative propositions, has three major goals, as does the study of any other type of human discourse.

(a) To *define* what we mean by causation (or its absence) and identify and classify the various forms it might take.

(b) To work out the *deductive* properties of causative propositions, i.e. how they are opposed to each other (whether or not they contradict each other, and so forth), what else can be immediately inferred from them individually (eduction), and what can be inferred from them collectively in pairs or larger numbers (syllogism).

(c) To explain how causative propositions are, to start with, *induced* from experience, or constructed from simpler propositions induced from experience.

Once these goals are fulfilled, in a credible manner (i.e. under strict logical supervision), we shall have a clearer perspective on wider issues, such as (d) whether there is a universal law of causation (as some philosophers affirm) or spontaneity is conceivable (as others claim), and (e) whether other forms of causality (notably volition, and its derivative influence) are conceivable.

Note well, we shall to begin with theoretically define and interrelate the various possible forms of causation, *leaving aside for now the epistemological issue as to how they are to be identified and established in practice, as well as discussions of ontological status*.

We shall thus in the present volume primarily deal with the main *technicalities* relating to reasoning about causation, and only later turn our attention to some larger epistemological and ontological issues (insofar as they can be treated prior to further analysis of the other forms of causality). The technical aspect may at times seem tedious, but it is impossible to properly understand causation and its implications without it. Most endless debates about causation (and more generally, causality) in the history of philosophy have arisen due to failure to first deal with technical issues.

2. The Paradigmatic Determination

Causation, or deterministic causality, varies in strength, according to the precise combinations of conditioning found to hold between the predications concerned. We may call the different forms thus identified the **determinations** of causation.

The *paradigm*, or basic pattern, of causation is its strongest determination. This has the form:

> **If the cause is present, the effect is invariably present**;
> **if the cause is absent, the effect is invariably absent**.

Our use, here, of the definite article, as in *the* cause or *the* effect, is only intended to pinpoint the predication under consideration, without meaning to imply that there is only one such cause or effect in the context concerned. Use of an indefinite article, as in *a* cause or *an* effect, becomes more appropriate when discussing a multiplicity of causes or effects, which as we shall later see may take various forms.

We may rewrite the above *static* formula in the following more *dynamic* expression:

> If the cause shifts from absent to present, the effect invariably shifts from absent to present;
>
> if the cause shifts from present to absent, the effect invariably shifts from present to absent;

We shall presently see how this model is variously reproduced in lesser determinations. For now, it is important to grasp the underlying principle it reflects.

The essence of causation (or 'effectuation') is that ***when some change is invariably accompanied by another, we say that the first phenomenon that has changed has "caused" (or "effected") the second phenomenon that has changed***. In the above model, the changes involved are respectively from the absence to the presence of the first phenomenon (called the cause) and from the absence to the presence of the second phenomenon (called the effect); or vice versa. We may, incidentally, commute this statement and say that the effect has been caused (or effected) by the cause.

Now, some comments about our terminology here:

The term "**change**," here, must be understood in a very broad sense, as referring to any event of difference, whatever its modality.

- Its primary meaning is, of course, *natural change*, with reference to *time* or more to the point with respect to broader changes in surrounding *circumstances*[92]. Here, the meaning is that some object or characteristic of an object which initially existed or appeared, later did not exist or disappeared (ceasing to be), or vice-versa (coming to be); or something existed or appeared at one place and time and recurred or reappeared at another place, at another time (mutation, alteration or movement). This gives rise to temporal and natural modalities of causation.
- Another, secondary sense is *diversity* in *individuals* or *groups*. This signifies that an individual object has different properties in different parts of its being[93]; or that a kind of object has some characteristic in some of its instances and lacks that characteristic (and possibly has another characteristic, instead) in some other of its instances. This gives rise to spatial and extensional modalities of causation.

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92 The difference between time and circumstance as concepts of reference seems very slim. How do we *pinpoint* an undefined 'circumstance' other than with reference to time? Yet the distinction seems important, since we construct two different types of modality or modes on its basis. The only answer I can think of for now is that whereas times (e.g. "on 17 August 1999, I wrote this footnote") are unrepeatable, circumstances (e.g. "at the time Turkey experienced an earthquake, I wrote this footnote") are in principle repeatable. A circumstance is loosely specified by *describing some events* in a time (without always intending that reference item to be more than coincidental – i.e. the earthquake did not cause me to write these comments).

93 This is the basis for a concept of *spatial modality*, which I did not treat in *Future Logic*. At the time I wrote that book, I did not take time to think about it. However, I can predict that the properties of this mode should be very similar to those of extensional modality, just as temporal modality is akin to natural (or circumstantial) modality. Spatial and temporal modality should behave in similar ways in various respects.

- Tertiary senses are *epistemic* or *logical change*, which focus respectively on the underlying acts of consciousness or the status granted them: something is at first noticed and later ignored, or believed and later doubted, or vice-versa, by someone. This gives rise to epistemic and logical modalities of causation.

Regarding the terms "**present**" and "**absent**" (i.e. not present), they may be understood variously, with reference to the situations just mentioned. They may signify existence or appearance or instancing (i.e. occurrence in some indicated cases) or being seen or being accredited true – or the negations of these.

The term "**phenomenon**" is here, likewise, intended very broadly, to include physical, mental or spiritual phenomena (things, appearances, objects), concrete or abstract. Also, a phenomenon may be static or dynamic: that is, the changing cause and effect need not be a quality or quantity or state or position, though some such static phenomena are always ultimately involved; the cause and effect may themselves be changes or events or movements. For instance, motion is change of place, acceleration is change in the speed or direction of motion. What matters is the switch from presence to absence, or vice-versa, of that thing, whatever its nature (be it static or dynamic). The cause and effect need not even be of similar nature; for example, a change of quality may cause a change of quantity.

Another term to clarify in the above principle is "**accompanied**," Here again, our intent is very large. The cause and effect may be in or of the same object or different objects, adjacent or apart in space, contemporaneous or in a temporal sequence. The definition of causation contains no prejudice in these respects, though we may eventually find fit to postulate relatively non-formal rules, such as that in natural causation the effect cannot precede the cause in time or that all causation at a distance implies intermediate contiguous causations[94].

94 Be it said in passing, these specific rules, mentioned here for purposes of illustration, though seemingly true for natural causation, are

Indeed, it is in some cases difficult for us, if not impossible, to say which of the two phenomena is the cause and which is the effect. And this often is not only an epistemological issue, but more deeply an ontological one. For, though there is sometimes a **direction of causation** to specify, there is often in fact no basis for such a specification. The phenomena named ‘cause’ and ‘effect’ are in a reciprocal relation of causation; the terms cause and effect are in such cases merely verbal distinctions. All that we can say is that the phenomena are bound together, and either can be accessed through the other; the labels applied to them become a matter of convenience for purposes of discourse.

Finally, the term “**invariably**” has to be stressed. How such constancy is established is not the issue here; we shall consider that elsewhere. In the paradigm of causation given above, it would not do for the conjunction of the cause and effect, or the conjunction of their negations, to be merely occasional. We would not regard such varying conjunctions as signifying genuine causation, but quite the opposite as signs of mere coincidence, happenstance of togetherness. *Post hoc ergo propter hoc.* The problem is complicated in lesser determinations of causation; but as we shall see it can be overcome, a constancy of conjunction or of non-conjunction is always ultimately involved.

In this context, a warning is in order. When something is invariably accompanied by another, we say that the first (the presence or absence of the cause) “is followed by” the second (the presence or absence of the effect). This refers to causal sequence and should not be confused with temporal sequence; the term “followed” is ambivalent (indeed, it is also used in

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certainly not relevant in the extensional or logical modes of causation. Indeed, it is no longer sure that a 'contiguity principle' applies universally even to natural causation: recent discoveries by physicists may suggest the existence of 'instant action at a distance' between pairs of particles, which seemingly goes against Relativity Theory prediction since the limit of the speed of light is not maintained. Whatever the theoretical physics outcome of such discoveries, the current question mark demonstrates that logic theory must remain open in such issues; i.e. principles like that of contiguity must be regarded as generalizations which might be abandoned if the need to do so is found overwhelming.

relation to spatial or numerical series). Even though causal and temporal sequence are often both involved (which is why the term "to follow" is equivocal), causal sequence may occur without temporal sequence (even in natural causation) or in a direction opposite to temporal sequence (though supposedly not in natural causation, certainly in logical causation, and by abstraction of the time factor also in extensional causation). The context usually makes the intent clear, of course.

Now, for some formal analysis:

In our present treatment of causation, we shall focus principally on the logical 'mode' of causation, note well. There are (as we shall later discuss) other modes, notably the natural, the temporal, the spatial and the extensional, whose definitions differ with respect to the type of modality considered. Having investigated modality and conditioning in detail in a previous treatise (*Future Logic*, 1990), I can predict that most of the behavior patterns of logical causation are likely to be found again in the other modes of causation; but also, that some significant differences are bound to arise.

Returning now to the paradigm of causation, it may be expressed more symbolically as follows, using the language of logical conditioning (as developed in my *Future Logic*, Part III):

> **If C, then E; and**
> **if notC, then notE.**

A sentence of the form "If P, then Q" means "the conjunction of P and the negation of Q is impossible," i.e. there are no knowledge-contexts where this conjunction (P + notQ) credibly occurs. Such a proposition can be recast in the contraposite form "If notQ, then notP," which means "the conjunction of notQ and the negation of notP is impossible" – the same thing in other words.

Such a proposition, note, does not formally imply that P is possible or that notQ is possible. Normally, we do take it for granted that such a proposition may be realized, i.e. that P is possible, and therefore (by apodosis) Q is possible and the

conjunction "P and Q" is possible; and likewise, that notQ is possible, and therefore (by apodosis) notP is possible and the conjunction "notQ and notP" is possible.

However, in some cases such assumption is unjustified. It may happen that, though "If P, then Q" is true, P is impossible, in which case "If P, then notQ" must also be true; or it may happen that, though "if P, then Q" is true, notQ is impossible, in which case "If notP, then Q" must also be true. These results are paradoxical, yet quite logical. I will not go into this matter in detail here, having dealt with it elsewhere. It is not directly relevant to the topic under discussion, except that it must be mentioned to stress that such paradox cannot occur in the context of causation (except to deny causation, of course).

Therefore, when discussing causation, it is tacitly understood that:

C is contingent and E is contingent[95].

That is, each of C, E is possible but unnecessary; likewise, by obversion, for their negations, each of notC, notE is possible but unnecessary. If any of these positive or negative terms is by itself necessary or impossible, it is an antecedent or consequent in valid (and possibly true) propositions, but it is not a cause or effect within the causation specified. This is, by the way, one difference in meaning between the expressions cause/effect, and the expressions antecedent/consequent. We shall see, as we deal with lesser determinations of causation, that their meanings diverge further. All the more so, when the terms cause/effect are used in other forms of causality.

Furthermore, as above shown with reference to "P" and "Q," granting the contingencies of C and E, each of the propositions

95 To avoid any confusion, we should add "in the type of modality characterizing the causal relation," But this specification would be incomprehensible to most readers, as the issue of mode of causation is dealt with in a later chapter.

"If C, then E" and "If notC, then notE" implies the following possibilities:

> The conjunction (C + E) is possible; and
> the conjunction (notC + notE) is possible.

All this is hopefully clear to the reader. But we must eventually consider its implications with reference to statements dealing with lesser determinations of causation or statements denying causation.

24. THE DETERMINATIONS OF CAUSATION

Drawn from The Logic of Causation (I:1999-2000), Chapters 2:1,3,5-6.

1. Strong Determinations

The strongest determination of causation, which we identified as the paradigm of causation, may be called complete and necessary causation. We shall now repeat the three constituent propositions of this form and their implications, all of which must be true to qualify:

(i) If C, then E;
(ii) if notC, then notE;
(iii) where: C is contingent and E is contingent.

As we saw, these propositions together imply the following:

The conjunction (C + E) is possible;
the conjunction (notC + notE) is possible.

Clauses (i) and (iii) signify complete causation. With reference to this positive component, we may call C a **complete cause** of E and E a **necessary effect** of C. Where there is complete causation, the cause is said to ***make necessary*** (or necessitate) the effect[96]. This signifies that the presence of C is *sufficient* (or enough) for the presence E.

96 The expression “X makes Y *impossible*” means that X makes notY necessary, incidentally.

Clause (ii) and (iii) signify necessary causation. With reference to this negative component, we may call C a **necessary cause** of E and E a **dependent effect** of C. Where there is necessary causation, the cause is said to ***make possible*** (or be necessitated by) the effect. This signifies that the presence of C is *requisite* (or indispensable) for the presence E[97].

Clause (iii) is commonly left tacit, though as we saw it is essential to ensure that the first two clauses do not lead to paradox. Strictly speaking, it would suffice, given (i), to stipulate that C is possible (in which case so is E) and E is unnecessary (in which case so is C). Or equally well, given (ii), that C is unnecessary (in which case so is E) and E is possible (in which case so is C). The possibilities of the conjunctions (C + E) and (notC + notE), logically follow, and so need not be included in the definition.

Looking at the paradigm, we can identify two distinct lesser determinations of causation, which as it were split the paradigm in two components, *each of which by itself conforms to the paradigm* through an ingenuous nuance, as shown below.

Also below, I list the various clauses of each definition, renumbering them for purposes of reference. Then a table is built up, including all the causal and effectual items involved (positive and negative) and all their conceivable combinations[98]. The *modus* of each item or combination, i.e. whether it is defined or implied as possible or impossible, or left open, is then identified. In each case, the *source* of such modus is noted, i.e. whether it is given or derivable from given(s).

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97 We commonly say, in such case, that C is a *sine qua non* (Latin for 'without which not') or *proviso* of E.

98 I use the word 'item' to refer to a cause or effect (or the negation of a cause or effect), indifferently. An item is, thus, for the logician, primarily a *thesis* (in the largest sense), i.e. a categorical or other form of proposition. But an item may also signify a *term*, since theses are ultimately predications. An item, then, is a thesis, or term within a thesis, involved in a causal proposition.

Complete causation:

(i) **If C, then E;**
(ii) **if notC, not-then E**;
(iii) where: **C is possible**.

Table 24.1. Complete causation.				
No.	Element /compound		Modus	Source /relationship
1	**C**		**possible**	**(iii)**
2	notC		possible	implied by (ii)
3		E	possible	implied by (i) + (iii)
4		notE	possible	implied by (ii)
5	C	E	possible	implied by (i) + (iii)
6	**C**	**notE**	**impossible**	**(i)**
7	notC	E	*open*	
8	**notC**	**notE**	**possible**	**(ii)**

Complete causation conforms to the paradigm of causation by means of the same main clause (i); whereas its clause (ii), note well, concerning what happens in the absence of C, substitutes for the invariable absence of E (i.e. "then notE"), the *not*-invariable *presence* of E (i.e. "not-then E"). However, remember, contraposition of (i) implies that "If notE, then notC," meaning that in the absence of E we can be sure that C is also absent[99].

Clause (ii) means that (notC + notE) is possible, so we are sure from it that C is unnecessary and E is unnecessary; also, it teaches us that C and E cannot be exhaustive. Technically, it would suffice for us to know that notE is possible, for we could then infer clause (ii) from (i); but it is best to specify clause (ii) to fit the paradigm of causation. As for clause (iii), we need only

99 In some but not all cases, notE not only implies but causes notC, note.

specify that C is possible; it follows from this and clause (i) that (C + E) is possible and so that E is also possible.

Note well the nuance that, to establish such causation, the effect has to be found *invariably* present in the presence of the cause, otherwise we would commit the fallacy of *post hoc ergo propter hoc*; but the effect need not be invariably absent in the absence of the cause: it suffices for the effect *not to be* invariably present.

The segment of the above table numbered 5-8 (shaded) may be referred to as the *matrix* of complete causation. It considers the possibility or impossibility of all conceivable conjunctions of all the items involved in the defining clauses or the negations of these items.

Necessary causation:

(i) **If notC, then notE**;
(ii) **if C, not-then notE**;
(iii) where: **C is unnecessary**.

Table 24.2. Necessary causation

No.	Element /compound		Modus	Source /relationship
1	C		possible	implied by (ii)
2	**notC**		**possible**	**(iii)**
3		E	possible	implied by (ii)
4		notE	possible	implied by (i) + (iii)
5	**C**	**E**	**possible**	**(ii)**
6	C	notE	*open*	
7	**notC**	**E**	**impossible**	**(i)**
8	notC	notE	possible	implied by (i) + (iii)

Necessary causation conforms to the paradigm of causation by means of the same main clause (i)[100]; whereas its clause (ii), note well, concerning what happens in the presence of C, substitutes for the invariable presence of E (i.e. "then E"), the *not*-invariable *absence* of E (i.e. "not-then notE"). However, remember, contraposition of (i) implies that "If E, then C," meaning that in the presence of E we can be sure that C is also present[101].

Clause (ii) means that (C + E) is possible, so we are sure from it that C is possible and E is possible; also, it teaches us that C and E cannot be incompatible. Technically, it would suffice for us to know that E is possible, for we could then infer clause (ii) from (i); but it is best to specify clause (ii) to fit the paradigm of causation. As for clause (iii), we need only specify that C is unnecessary; it follows from this and clause (i) that (notC + notE) is possible and so that E is also unnecessary.

Note well the nuance that, to establish such causation, the effect has to be found *invariably* absent in the absence of the cause, otherwise we would commit the fallacy of *post hoc ergo propter hoc*; but the effect need not be invariably present in the presence of the cause: it suffices for the effect *not to be* invariably absent.

Note the *matrix* of necessary causation, i.e. the segment of the above table numbered 5-8 (shaded).

Lastly, notice that complete and necessary causation are *'mirror images'* of each other. All their characteristics are identical, except that the polarities of their respective cause and effect opposite: C is replaced by notC, and E by notE, or vice-versa. The one represents the positive aspect of strong causation; the other, the negative aspect. Accordingly, their logical properties correspond, *mutatis mutandis* (i.e. if we make all the appropriate changes).

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100 Notice that clause (i), here, in necessary causation, was labeled as clause (ii) in complete and necessary causation. The numbering is independent.

101 In some but not all cases, E not only implies but causes C, note.

Following the preceding analysis of necessary and complete causation into two distinct components each of which independently conforms to the paradigm, we can conceive of complete causation *without* necessary causation and necessary causation *without* complete causation. These two additional determinations of causation are conceivable, note well, only because they do not infringe logical laws; that is, we already know that the various propositions that define them are individually and collectively logically compatible.

2. Parallelism of Strongs

Before looking into weaker determinations of causation, we must deal with the phenomenon of *parallelism*.

The definition of complete causation does not exclude that there be some cause(s) other than C – such as say C_1 – having the same relation to E. In such case, C and C_1 may be called *parallel complete causes* of E. The minimal relation between such causes is given by the following normally valid 2nd figure syllogism:

> If C, then E (and if notC, not-then E / and C is possible);
>
> and if C_1, then E (and if notC_1, not-then E / and C_1 is possible);
>
> therefore, if notC_1 not-then C (= if notC, not-then C_1 – by contraposition).

The possibility of parallel complete causes is clear from the logical compatibility of these premises, which together merely imply that in the absence of E both C and C_1 are absent. The main clauses of the premises can be merged in a compound proposition of the form "If notE, then neither C nor C_1," which by contraposition yields "If C or C_1, then E," Thus, such parallel causes may be referred to as 'alternative' complete causes (in a large sense of the term 'alternative').

Since the conclusion of the above syllogism is subaltern to each of the propositions "if notC_1, then notC" and "if notC, then

notC_1," it may happen that C implies C_1 and/or C_1 implies C – but they need not do so. Likewise, since the conclusion is compatible with the proposition "if C_1, then notC" or "if C, then notC_1," it may happen that C and C_1 are incompatible with each other – but they do not have to be. The conclusion merely specifies that C and C_1 not be exhaustive (i.e. be neither contradictory nor subcontrary; this is the sole formal specification of the disjunction in "If C or C_1, then E").

Similarly, still in complete causation, E need not be the exclusive necessary effect of C; there may be some other thing(s) – such as say E_1 – which invariably follow C, too. In such case, E and E_1 may be called *parallel necessary effects* of C. The minimal relation between such effects is given by the following normally valid 3rd figure syllogism.

> If C, then E (and if notC, not-then E_1 / and C is possible);
>
> and if C, then E_1 (and if notC, not-then E_1 / and C is possible);
>
> therefore, if E_1, not-then notE (= if E, not-then notE_1 – by contraposition).

The possibility of parallel necessary effects is clear from the logical compatibility of these premises, which together merely imply that in the presence of C both E and E_1 are present. The main clauses of the premises can be merged in a compound proposition of the form "If C, then both E and E_1," Thus, such parallel effects may be said to be 'composite' necessary effects.

Since the conclusion of the above syllogism is subaltern to each of the propositions "if E_1, then E" and "if E, then E_1," it may happen that E_1 implies E and/or E implies E_1 – but they need not do so. Likewise, since the conclusion is compatible with the proposition "if notE_1, then E" or "if notE, then E_1," it may happen that E and E_1 are exhaustive – but they do not have to be. The conclusion merely specifies that E and E_1 not be incompatible (i.e. be neither contradictory nor contrary).

Again, *mutatis mutandis*, the definition of necessary causation does not exclude that there be some cause(s) other than C – such as say C_1 – having the same relation to E. In such case, C and C_1 may be called *parallel necessary causes* of E. The minimal relation between such causes is given by the following normally valid 2nd figure syllogism:

> If notC, then notE (and if C, not-then notE / and notC is possible);
>
> and if notC_1, then notE (and if C_1, not-then notE / and notC_1 is possible);
>
> therefore, if C_1, not-then notC (= if C, not-then notC_1 by contraposition).

The possibility of parallel necessary causes is clear from the logical compatibility of these premises, which together merely imply that in the presence of E both C and C_1 are present. The main clauses of the two premises can be merged in a compound proposition of the form "If E, then both C and C_1," which by contraposition yields "If notC or notC_1, then notE," Thus, such parallel causes may be referred to as 'alternative' necessary causes (in a large sense of the term 'alternative').

Since the conclusion of the above syllogism is subaltern to each of the propositions "if C_1, then C" and "if C, then C_1," it may happen that C_1 implies C and/or C implies C_1 – but they need not do so. Likewise, since the conclusion is compatible with the proposition "if notC_1, then C" or "if notC, then C_1," it may happen that C and C_1 are exhaustive – but they do not have to be. The conclusion merely specifies that C and C_1 not be incompatible (i.e. be neither contradictory nor contrary; this is the sole formal specification of the disjunction in "If notC or notC_1, then notE").

Similarly, still in necessary causation, E need not be the exclusive dependent effect of C; there may be some other thing(s) – such as say E_1 – which are invariably preceded by C, too. In such case, E and E_1 may be called *parallel dependent*

effects of C. The minimal relation between such effects is given by the following normally valid 3rd figure syllogism:

> If notC, then notE (and if C, not-then notE / and notC is possible);
>
> and if notC, then notE_1 (and if C, not-then notE_1 / and notC is possible);
>
> therefore, if notE_1, not-then E (= if notE, not-then E_1 by contraposition).

The possibility of parallel dependent effects is clear from the logical compatibility of these premises, which together merely imply that in the absence of C both E and E_1 are absent. The main clauses of the premises can be merged in a compound proposition of the form "If notC, then neither E nor E_1," Thus, such parallel effects may be said to be 'composite' dependent effects.

Since the conclusion of the above syllogism is subaltern to each of the propositions "if notE_1, then notE" and "if notE, then notE_1," it may happen that E implies E_1 and/or E_1 implies E – but they need not do so. Likewise, since the conclusion is compatible with the proposition "if E_1, then notE" or "if E, then notE_1," it may happen that E and E_1 are incompatible with each other – but they do not have to be. The conclusion merely specifies that E and E_1 not be exhaustive (i.e. be neither contradictory nor subcontrary).

It happens that parallel causes or parallel effects are themselves causally related. That this is possible, is implied by what we have seen above. Since each of the following pairs of items may have any formal relation with one exception, namely:

- parallel complete causes cannot be exhaustive (since "if notC, not-then C_1" is true for them); and parallel necessary effects cannot be incompatible (since "if E, not-then notE_1" is true for them);
- parallel necessary causes cannot be incompatible (since "if C, not-then notC_1" is true for them); and parallel dependent

effects cannot be exhaustive (since "if notE, not-then E_1" is true for them);

... it follows that either one of parallel causes C and C_1 may be a complete or necessary cause of the other; and likewise, either one of parallel effects E and E_1 may be a complete or necessary cause of the other.

In certain situations, as we shall see in a later chapter, it is possible to infer such causal relations between parallels. But, it must be stressed, the mere fact of parallelism does not in itself imply such causal relations.

In sum, complete and/or necessary causation should not be taken to imply *exclusiveness* (i.e. that a unique cause and a unique effect are involved); such relation(s) allow for *plurality* of causes or effects in the sense of parallelism as just elucidated.

Indeed, it is very improbable that we come across exclusive relations in practice, since every existent has many facets, each of which might be selected as cause or effect. Our focusing on this or that aspect as most significant or essential, is often arbitrary, a matter of convenience; though often, too, it is guided by broader considerations, which may be based on intuition of priorities or complicated reasoning.

In any case, it is important to distinguish plurality arising in strong causation, which signifies alternation of causes or composition of effects, as above, from plurality arising in weak causation, which signifies composition of causes or alternation of effects, which we shall consider in the next section.

3. Weak Determinations

Having clarified the complete and necessary forms of causation, as well as parallelism, we are now in a position to deal with lesser determinations of causation. Let us first examine partial causation; contingent causation will be dealt with further on.

Partial causation:

(i) **If (C1 + C2), then E**;
(ii) **if (notC1 + C2), not-then E**;
(iii) **if (C1 + notC2), not-then E**;
(iv) where: **(C1 + C2) is possible**.

Table 24.3. Partial causation.

No.	Element/compound			Modus	Source/relationship
1	C1			possible	implied by (iii) or (iv)
2	notC1			possible	implied by (ii)
3		C2		possible	implied by (ii) or (iv)
4		notC2		possible	implied by (iii)
5			E	possible	implied by (i) + (iv)
6			notE	possible	implied by (ii) or (iii)
7	C1		E	possible	implied by (i) + (iv)
8	C1		notE	possible	implied by (iii)
9	notC1		E	*open*	
10	notC1		notE	possible	implied by (ii)
11		C2	E	possible	implied by (i) + (iv)
12		C2	notE	possible	implied by (ii)
13		notC2	E	*open*	
14		notC2	notE	possible	implied by (iii)
15	**C1**	**C2**		**possible**	**(iv)**
16	C1	notC2		possible	implied by (iii)
17	notC1	C2		possible	implied by (ii)
18	notC1	notC2		*open*	
19	C1	C2	E	possible	implied by (i) + (iv)
20	**C1**	**C2**	**notE**	**impossible**	**(i)**
21	C1	notC2	E	*open*	
22	**C1**	**notC2**	**notE**	**possible**	**(iii)**
23	notC1	C2	E	*open*	
24	**notC1**	**C2**	**notE**	**possible**	**(ii)**
25	notC1	notC2	E	*open*	
26	notC1	notC2	notE	*open*	

Two phenomena C1, C2 may be called **partial causes** of some other phenomenon E, only if *all* the above conditions (i.e. the four defining clauses) are satisfied. In such case, we may call E

a **contingent effect** of each of C1, C2. Of course, the *compound* (C1 + C2) is a complete cause of E, since in its presence, E follows (as given in clause (i)); and in its absence, i.e. if not(C1 + C2), E does not invariably follow (as evidenced by clauses (ii) and (iii)). Rows 19-26 of the above table (shaded) constitute the matrix of partial causation.

We may thus speak of this phenomenon as a composition of partial causes; and stress that C1 and C2 belong in that particular causation of E by calling them *complementary* partial causes of it. Indeed, instead of saying "C1 and C2 are complementary partial causes of E," we may equally well formulate our sentence as "C1 (complemented by C2) is a partial cause of E" or as "C2 (complemented by C1) is a partial cause of E," These three forms are identical, except for that the first treats C1 and C2 with equal attention, whereas the latter two lay stress on one or the other cause. Such reformatting, as will be seen, is useful in some contexts.

We may make a distinction between *absolute* and *relative* partial causation, as follows. The 'absolute' form specifies one partial cause without mentioning the complement(s) concerned; it just says: "C1 is a partial cause of E," meaning "C1 (*with some unspecified complement*) is a partial cause of E," This is in contrast to the 'relative' form, which does specify a complement, as in the above example of "C1 (complemented by C2) is a partial cause of E," This distinction reflects common discourse. Its importance will become evident when we consider negations of such forms.

One way to see the appropriateness of our definition of partial causation, *its conformity to the paradigm of causation*, is by resorting to nesting. We may rewrite it as follows:

From (i)	if C2, then (if C1, then E);
from (ii)	if C2, then (if notC1, not-then E);
from (iii)	if notC2, not-then (if C1, then E).[102]

102 These three forms are implied, respectively, by our first givens; but they do not imply them unconditionally.

Clause (i) tells us that given C2, C1 implies E. Clause (ii) tells us that given C2, notC1 does not imply E. Thus, under condition C2, C1 behaves like a complete cause of E. Moreover, clause (iii) shows that under condition notC2, C1 ceases to so behave. Similarly, *mutatis mutandis*, C2 behaves conditionally like a complete cause of E.[103]

Let us now examine the definition of partial causation more closely. The terminology adopted for it is obviously intended to contrast with that for complete causation.

Clause (i) informs us that in the presence of the two elements C1 and C2 together, the effect is invariably also present. However, that clause alone would not ensure that both C1 and C2 are *relevant* to E, *participants* in its causation. We need clause (ii) to establish that without C1, C2 would not by itself have the same result. And, likewise, we need clause (ii) to establish that without C2, C1 would not by itself have the same result.

Suppose, for instance, clause (ii) were false; then, combining it with (i), we would obtain the following simple dilemma:

> If (C1 + C2), then E – and – if (notC1 + C2), then E;
>
> therefore, if C2, then E.

That is, C2 would be a complete cause of E, without need of C1, which would in such case be *an accident* in the relation “If (C1 + C2), then E,” note well. Similarly, if clause (iii) were false, it would follow that C1 is sufficient by itself for E, irrespective of C2. In the special case where both (ii) and (iii) are denied, C1 and C2 would be parallel complete causes of E (compatible ones, since they are conjoined in the antecedent of clause (i)).

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103 We can also, incidentally, view the matter as follows, by focusing on the nested clauses. Clauses (i) and (iii) mean that the partial cause C2 of E may be regarded as a complete cause of the new effect “if C1, then E,” Similarly, *mutatis mutandis*, clauses (i) and (ii) can be taken to mean that C1 is a complete cause of “if C2, then E,”

Therefore, as well as clause (i), clauses (ii) and (iii) have to specified for partial causation.

Furthermore, our definition of partial causation thus mentions three combinations of C1, C2 and their respective negations, namely:

- C1 + C2
- notC1 + C2
- C1 + not C2

And it tells us what happens in relation to E in each of these situations: in the first, E follows; in the next two, it does not. One might reasonably ask, what about the fourth combination, namely:

- notC1 + notC2?[104]

Well, for that, there are only two possibilities: either E follows or it does not. Note first that both these possibilities are logically compatible with clauses (i), (ii) and (iii).

Suppose that "If (notC1 + notC2), then E" is true. In that case, notC1 and notC2 would each have the same relation to E that C1 and C2 have by virtue of clauses (i), (ii), (iii). For if we combine this supposed additional clause with clauses (ii) and (iii), we see that, whereas E follows the conjunction of notC1 and notC2, E does not follow the conjunction of not(notC1) with notC2 or that of notC1 with not(notC2). In that case, we would simply have two, instead of just one, compound causes of E, namely (C1 + C2) and (notC1 + notC2), sharing the same clauses (ii) and (iii)

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104 Note that the combination "notC1 + notC2" may occasionally be impossible. In such case, notC1 implies C2 and notC2 implies C1. But according to syllogistic theory (see *Future Logic*, pp. 158-160), this would *not* allow us to abbreviate clauses (ii) and (iii) of the definition to "If notC1, not-then E" and "If notC2, not-then E," Thus, even in such case, the definition remains unaffected.

which establish the relevance of each of the elements. Though at first sight surprising, such a state of affairs is quite conceivable, being but a special case of parallel causation! Thus, the proposition “If (notC1 + notC2), then E” may well be true. But may it be false? Suppose that its contradictory “If (notC1 + notC2), not-then E” is true, instead. Here again, the causal significance of the first three clauses remains unaffected. We can thus conclude that what happens in the situation “notC1 + notC2,” i.e. whether E follows or not, is irrelevant to the roles played by C1 and C2. Our definition of partial causation through the said three clauses is thus satisfactory.

Lastly the following should be noted. If we replaced clauses (ii) and (iii) by “If not(C1 + C2), not-then E,” to conform with clause (i) to the definition of complete causation, we would only be sure that the compound (C1 + C2) causes E. It does not suffice to establish that both its elements are involved in that causation, since it could be adequately realized by the eventuality that “If (notC1 + notC2), not-then E,” For this reason, too, clauses (ii) and (iii) are unavoidable.

Regarding clause (iv), which serves to ensure that the first three clauses do not lead to paradox, it is easy to show that the possibility of the conjunction (C1 + C2) is the minimal requirement. For this through clause (i) implies that E is possible and (C1 + C2 + E) is possible. Additionally, clause (ii) means that (notC1 + C2 + notE) is possible, and therefore implies that (notC1 + C2) is possible and each of notC1, C2, notE is possible. Similarly, clause (iii) means that (C1 + notC2 + notE) is possible, and therefore implies that (C1 + notC2) is possible and each of C1, notC2, notE is possible. It is thus redundant to specify these various contingencies.

The **methodological principle** underlying the definition of partial causation is well known to scientists and oft-used. It is that *to establish the causal role of any element such as C1, of a compound (C1 + C2...) in whose presence a phenomenon E is invariably present, we must find out what happens to E when the element C1 is absent while all other elements like C2 remain present*. That is, we observe how the putative effect is affected

by removal of the putative cause ***while keeping all other things equal***[105]. Only if a change in status occurs (minimally from "then E" to "not-then E"), may the element be considered as participating in the causation, i.e. as a relevant *factor*.

Once this is understood, it is easy to generalize our definition of partial causation from two factors (C1, C2) to any number of them (C1, C2, C3...), as follows:

(i) If (C1 + C2 + C3...), then E;
(ii) if (notC1 + C2 + C3...), not-then E;
(iii) if (C1 + notC2 + C3...), not-then E;
(iv) if (C1 + C2 + notC3...), not-then E;
...etc. (if more than three factors);
and (C1 + C2 + C3...) is possible.

Clause (i) establishes the complete causation of the effect E by the compound (C1 + C2 + C3...). But additionally, there has to be for each element proof that its absence would be felt: this is the role of clauses (ii), (iii), (iv)..., each of which negates *one and only one* of the elements concerned. Thus, the number of additional clauses is equal to the number of factors involved.

Whatever the relation to E of other possible combinations of the elements and their negations, the partial causation of E by elements C1, C2, C3... is settled by the minimum number of clauses specified in our definition. As we saw, with two factors the combination "notC1 + notC2" is not significant. Similarly, we can show that with three factors the following combinations are not significant:

- notC1 + notC2 +C3
- notC1 + C2 + notC3

105 This phrase "keeping all other things equal" is not mine – but a consecrated phrase often found in textbooks. I do not know who coined it first.

- C1 + notC2 + notC3
- notC1 + notC2 + notC3

And so forth. Generally put, if the number of elements is n, the number of insignificant combinations will be: $2^n - (1 + n)$. Whether any of these further combinations implies or does not imply E does not affect the role of partial causation signified by the defining clauses for the factors C1, C2, C3... per se. Other causations may be involved in certain cases, but they do not disqualify or diminish those so established.

The very last clause, that (C1 + C2 + C3...) is possible, is required and sufficient, for reasons already seen.

Clearly, we can say that *the more factors are involved, the weaker the causal bond*. If C is a complete cause of E, it plays a big role in the causation of E. If C1 is a partial cause of E, with one complement C2, it obviously plays a lesser role than C. Similarly, the more complements C1 has, like C2, C3..., the less part it plays in the whole causation of E. We may thus view the degree of determination involved as inversely proportional to the number of causes involved, though we may (note well) be able to assign different *weights* to the various partial causes[106].

Note finally that we can facilitate mental assimilation of multiple (i.e. more than two) partial causes through successive reductions to pairs of partial causes, one of which is compound. Thus, (C1 + C2 + C3 + ...) may be viewed as (C1 + (C2 + C3 +...)), *provided* all the above-mentioned conditions are entirely satisfied.

Let us now turn our attention to contingent causation.

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106 For instance, with reference to concomitant variations (see Appendix on J. S. Mill's Methods); if the C1 and C2 enter in a mathematical formula like, say, E = C12 + C2, C1 has less weight than C2.

Contingent causation:

(i) **If (notC1 + notC2), then notE**;
(ii) **if (C1 + notC2), not-then notE**;
(iii) **if (notC1 + C2), not-then notE**;
(iv) where: **(notC1 + notC2) is possible**.

Table 24.4. Contingent causation.					
No.	Element/compound			Modus	Source/relationship
1	C1			possible	implied by (ii)
2	notC1			possible	implied by (iii) or (iv)
3		C2		possible	implied by (iii)
4		notC2		possible	implied by (ii) or (iv)
5			E	possible	implied by (ii) or (iii)
6			notE	possible	implied by (i) + (iv)
7	C1		E	possible	implied by (ii)
8	C1		notE	*open*	
9	notC1		E	possible	implied by (iii)
10	notC1		notE	possible	implied by (i) + (iv)
11		C2	E	possible	implied by (iii)
12		C2	notE	*open*	
13		notC2	E	possible	implied by (ii)
14		notC2	notE	possible	implied by (i) + (iv)
15	C1	C2		*open*	
16	C1	notC2		possible	implied by (ii)
17	notC1	C2		possible	implied by (iii)
18	**notC1**	**notC2**		**possible**	**(iv)**
19	C1	C2	E	*open*	
20	C1	C2	notE	*open*	
21	**C1**	**notC2**	**E**	**possible**	**(ii)**
22	C1	notC2	notE	*open*	
23	**notC1**	**C2**	**E**	**possible**	**(iii)**
24	notC1	C2	notE	*open*	
25	**notC1**	**notC2**	**E**	**impossible**	**(i)**
26	notC1	notC2	notE	possible	implied by (i) + (iv)

Two phenomena C1, C2 may be called **contingent causes** of some other phenomenon E, only if *all* the above conditions (i.e. the four defining clauses) are satisfied. In such case, we may call

E a **tenuous effect**[107] of each of C1, C2. Of course, the *compound* (notC1 + notC2) is a necessary cause of E, since in its presence, notE follows (as given in clause (i)); and in its absence, i.e. if not(notC1 + notC2), notE does not invariably follow (as evidenced by clauses (ii) and (iii)). Rows 19-26 of the above table (shaded) constitute the matrix of contingent causation.

We may thus speak of this phenomenon as a composition of contingent causes; and stress that that C1 and C2 belong in that particular causation of E by calling them *complementary* contingent causes of it. Indeed, instead of saying "C1 and C2 are complementary contingent causes of E," we may equally well formulate our sentence as "C1 (complemented by C2) is a contingent cause of E" or as "C2 (complemented by C1) is a contingent cause of E," These three forms are identical, except for that the first treats C1 and C2 with equal attention, whereas the latter two lay stress on one or the other cause. Such reformatting, as will be seen, is useful in some contexts.

We may make a distinction between *absolute* and *relative* contingent causation, as follows. The 'absolute' form specifies one contingent cause without mentioning the complement(s) concerned; it just says: "C1 is a contingent cause of E," meaning "C1 (*with some unspecified complement*) is a contingent cause of E," This is in contrast to the 'relative' form, which does specify a complement, as in the above example of "C1 (complemented by C2) is a contingent cause of E," This distinction reflects common discourse. Its importance will become evident when we consider negations of such forms.

Here again, we can demonstrate that our definition of contingent causation *conforms to the paradigm of causation* through nesting. We may rewrite it as follows:

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107 I use the name "tenuous effect" for lack of a better one, to signify a lesser degree of non-independence than a "dependent effect," Alternatively, broadening the connotation of dependence, we might say that the effect of a necessary cause is strongly dependent (it depends on that one cause) and the effect of a contingent cause is weakly dependent (it depends on that cause, if no other is available).

From (i) if notC2, then (if notC1, then notE);
from (ii) if notC2, then (if C1, not-then notE);
from (iii) if C2, not-then (if notC1, then notE).

Clause (i) tells us that given notC2, notC1 implies notE. Clause (ii) tells us that given notC2, C1 does not imply notE. Thus, under condition notC2, C1 behaves like a necessary cause of E. Moreover, clause (iii) shows that under condition C2, C1 ceases to so behave. Similarly, *mutatis mutandis*, C2 behaves conditionally like a necessary cause of E.

Note well that the main clause of contingent causation is not "If not(C1 + C2), then notE"[108], but more specifically "If (notC1 + notC2), then notE," Considering that in partial causation the antecedent is (C1 + C2) and that this compound behaves as a complete cause, one might think that in contingent causation the antecedent would be a negation of the same compound, i.e. not(C1 + C2), which would symmetrically behave as a necessary cause. But the above demonstration of conformity to paradigm shows us that this is not the case. The explanation is simply that two of the alternative expressions of "If not(C1 + C2), then notE," namely "If (C1 + notC2), then notE" and "If (notC1 + C2), then notE" are contradictory to clauses (ii) and (iii), respectively. Therefore, only "If (notC1 + notC2), then notE" is a formally appropriate expression in this context. Our definition of contingent causation is thus correct.

We need not repeat our further analysis of partial causation for contingent causation; all that has been said for the former can be restated, *mutatis mutandis*, for the latter. For partial and contingent causation are *'mirror images'* of each other. The one represents the positive aspect of weak causation; the other, the negative aspect. All their characteristics are identical, except that the polarities of their respective causes and effect are opposite:

108 This form, note well, does not specify which of the three alternative combinations (C1 + notC2), (notC1 + C2) or (notC1 + notC2) implies notE; it means only that *at least one of them* does.

C1 is replaced by notC1, C2 by notC2, and E by notE, or vice-versa.

Note that partial and contingent causation each involves a *plurality* of causes, though *in a different sense* from that found in parallelism.

We should also mention that partial causation often underlies *alternation* or plurality of effects.

Consider the form "If C, then (E or E_1)," which may be interpreted as "the conjunction (C + notE + notE1) is impossible," and therefore implies "If (C + notE), then E_1" and "If (C + notE_1), then E," Take the latter, for instance, and you have a type (i) clause. If, additionally, it is true that (notC + notE_1 + notE), (C + E_1 + notE), (C + notE_1) are possible conjunctions, you have clauses of types (ii), (iii) and (iv), respectively. In such case[109], C is a partial cause of E (the other partial cause being notE_1 or, more precisely, some complete and necessary cause of notE_1).

Just as we may have plurality of effects in partial causation, so we may have it in contingent causation.

Note, concerning the term '*occasional*'. When parallel complete causes may occur separately (i.e. neither implies the other), they are often called occasional causes; however, note well, the same term is often used to refer to partial causes, in the sense that each of them is effective only when the other(s) is/are present. The term occasional effect is used with reference to alternation of effects; i.e. when a cause has alternative effects, each of the latter is occasional; but the term is also applicable more generally, to any effect of a partial cause as such, i.e. to contingent effects.

Partial and contingent causation may conceivably occur in tandem or separately; i.e. no formal inconsistency arises in such cases.

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109 As can be seen by renaming C as "C1" and notE1 as "C2,"

4. Parallelism of Weaks

Before going further let us here deal with parallelism in relation to the weaker determinations of causation.

In partial causation, this would mean, that there are two (or more) sets of two (or more) partial causes, viz. C1, C2... and C3, C4... (and so forth), with the same effect E:

> If (C1 + C2...), then E; etc.
> If (C3 + C4...), then E; etc.
> ...

Clearly, we have 'plurality of causes' in *both* senses of the term at once, here. By "etc.," I refer to the further clauses involved in partial causation, such as "if (C1 + notC2), not-then E" and so on, here left unsaid to avoid repetitions. Such statements may be merged; thus, the above two become a single statement in which each bracketed conjunction constitutes an alternative complete cause:

> If (C1 + C2...) or (C3 + C4...) or..., then E; etc.

The bracketed conjunctions, as we have seen when dealing with parallel complete causes, may be interrelated in various ways except be exhaustive. These interrelations would be expressed in additional statements. The resulting information, including the above statement where all the conjunctions are disjoined in a single antecedent and numerous statements not made explicit here, can then be analyzed in great detail by tabulating all the items and their negations, and considering the modus of each combination. We can, in this way, have a clear picture of all eventualities, and avoid all ambiguity.

Similarly, *mutatis mutandis*, for contingent causation:

> If (notC1 + notC2...), then notE; etc.
> If (notC3 + notC4...), then notE; etc.

...

We may merge these complex causal statements, consider additional specifications regarding the opposition of alternatives, and analyze the mass of information through a table.

Note the following special cases of the above parallelisms.

A partial cause may be found *common* to two (or more) such causations with the same effect; if say C3 is identical with C1, C1 would have C2... as complement(s) in the first relation and C4... as complement(s) in the second, without problem. But may something (say C1) be a partial cause in one relation and its negation (say, notC1 = C3) a partial cause in the other? Yes, since the negation of E would imply both not(C1 + C2...) and not(notC1 + C4...), which is consistent; except that in such case the two compounds could not occur together.

Similarly, a contingent cause may be found *common* to two (or more) such causations with the same effect; if say C3 is identical with C1, notC1 would have notC2... as complement(s) in the first relation and notC4... as complement(s) in the second, without problem. But may something (say C1) be a contingent cause in one relation and its negation (say, notC1 = C3) a contingent cause in the other? Yes, since the negation of notE would imply both not(notC1 + notC2...) and not(C1 + notC4...), which is consistent; except that in such case the two compounds could not occur together.

5. The Four Genera of Causation

We have found the minimal formal definitions of, respectively, complete, necessary, partial and contingent causation. We are now in a position to begin synthesizing our accumulated findings concerning these determinations of causation. Remember how we developed these four concepts....

We started with the paradigm of causation (later named complete and necessary causation). From this we *abstracted two*

constituent forms, or (strong) determinations, which we called complete causation and necessary causation. Then we *derived by means of an analogy two additional forms*, or (weak) determinations, which we called by way of contrast partial causation and contingent causation.

These four constructs apparently *exhaust* what we mean by causation, in view of their respective conceptual derivations from the paradigm of causation, and of their symmetry in relation to each other and the whole. No further expressions of the concept of causation, direct or indirect, seem conceivable.

The four forms thus identified can thus be referred to as the genera of causation, or as its **generic determinations**. And we can safely postulate that:

> ***Nothing can be said to be a cause or effect of something else (in the causative sense), if it is not related to it in the way of at least one of these four genera of causation.***

We shall need **symbols** for these four genera, to facilitate their discussion. I propose (remember them well) the following letters, simply:

n for Necessary causation,

m for coMplete causation (to rhyme with **n**),

p for Partial causation, and

q for 'Qontingent' causation (to rhyme with **p**)[110].

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110 I have previously used, in my work *Future Logic*, the letters **n** and **p** for the *modalities* of necessity and possibility (or more specifically, particularity or potentiality). These should not be confused, note well. In any case, their relations are very different. In modality, **n** implies **p** (i.e. if something is necessary, it is possible). But here, in causation, as we shall soon see, **n** and **p** are merely compatible (i.e. a necessary cause need not be a partial cause, though something may be both a necessary and partial cause).

This notation will be found particularly useful when we deal with causative syllogism. We will also occasionally distinguish between absolute and relative partial or contingent causation, by means of the symbols: $\mathbf{p}_{abs}$ and $\mathbf{q}_{abs}$ for absolutes (i.e. those not mentioning any complement) and $\mathbf{p}_{rel}$ and $\mathbf{q}_{rel}$ for relatives (i.e. those specifying some complement). Unless specified as relative, **p** and **q** may always be considered absolute.

It follows from what we have just said that we may interpret the causative proposition "**P is a cause of Q**" as "P is a complete or necessary or partial or contingent cause of Q (or a consistent combination of these alternatives),"

It is easy to demonstrate that any compounds of the four genera involving both **m** and **p**, and/or both **n** and **q**, are inconsistent, i.e. formally excluded. That is, one and the same thing cannot be both a complete and partial cause of the same effect; for if clause (i) of **m**, namely "if C1, then E," is true, then clause (iii) of **p**, namely "if (C1 + notC2), not-then E," cannot be true, and vice-versa. Similarly, necessary and contingent causation, i.e. **n** and **q**, are incompatible. We shall see at a later stage that certain other combinations are also formally impossible.

We shall consider the remaining, *consistent compounds* involving the four generic determinations, which we shall call the **specific determinations**, in the next chapter.

We may, as already suggested, refer to something as a *strong cause*, if it is a complete and/or necessary cause; and to something as a *weak cause*, if it is a partial and/or contingent cause. Conversely, a necessary and/or dependent effect may be said to be a *strong effect*; and a contingent and/or tenuous effect, it may be said to be a *weak effect*. Mixtures of these characters are conceivable, as we shall see.

Another classification based on common characters: if something is known to be a complete or partial cause, it may be called a '*contributing cause*'[111]; and if something is known to be a necessary or contingent cause, it may be called a '*possible*

111 In the sense that it is a cause *to some extent*, sufficient or not.

cause'. Likewise, if something is known to be a necessary or contingent effect, it may be called a '*possible effect*'; and if something is known to be a dependent or tenuous effect, it may be called (say) a '*subject effect*'.

Moreover: we have characterized complete and partial causation as positive aspects of causation; and necessary and contingent causation as its negative aspects, comparatively. We may in this sense, relative to a given set of items, speak of 'positive' or 'negative' causation. The latter, of course, should not be confused with negations of causation. Accordingly, we may refer to *positive or negative causes or effects*.

The reader is referred to the Appendix on J. S. Mill's Methods, for comparison of our treatment of causation in this chapter (and the next).

6. Negations of Causation

So far, we have only considered in detail *positive* causative propositions, i.e. statements affirming causation of some determination. We must now look at *negative* causative propositions, i.e. statements denying causation of some determination or any causation whatever. For this purpose, to avoid the causal connotations implied by use of symbols like C and E for the items involved, we shall rather use neutral symbols like P and Q.

Statements denying causation may be better understood by studying the negations of conditional propositions.

A *'positive hypothetical'* proposition has the form "If X, then Y" (which may be read as X implies Y, or X is logically followed by Y); it means by definition "the conjunction (X + notY) is impossible," Its contradictory is a *'negative hypothetical'* proposition of the form "If X, not-then Y"[112] (which may be read

112 The proposition "If X, not-then Y" is not to be confused with "If X, then notY," note well. The latter implies but is not implied by the former.

as X does not imply Y, or X is not logically followed by Y); it means by definition "the conjunction (X + notY) is possible,"

In the positive form, though X and notY are together impossible, they are not implied (or denied) to be individually impossible. In the negative form, since X and notY are possible together, *each of* X, notY is also formally implied as possible. In either form, there is no formal implication that notX be possible or impossible, or that Y be possible or impossible. As for the remaining conjunctions (X + Y), (notX + Y), (notX + notY) – nothing can be inferred concerning them, either.

However, as we have seen, when such statements appear as implicit clauses of causation, the interactions between clauses will inevitably further specify the situation for many of the items concerned.

The negation of complete causation or necessary causation, through statements like "P is not a complete cause of Q" or "P is not a necessary cause of Q," is feasible if *any one or more* of the three constituent clauses of such causation is deniable. That is, such negation consists of a disjunctive proposition saying "not(i) and/or not(ii) and/or not(iii)," which may signify non-causation or another determination of causation (necessary instead of complete, or vice-versa, or a weaker form of causation).

To give an example: the denial of "P is a complete cause of Q" means "if P, not-then Q" *and/or* "if notP, then Q" *and/or* "P is impossible," These alternatives may give rise to different outcomes; in particular note that if "P is impossible" is true, then P cannot be a cause at all, and if "if P, then Q" and "if notP, then Q" are both true, then Q is necessary, in which case Q cannot be an effect at all.

The negation of strong causation as such means the negation of both complete and necessary causation.

With regard to negation of partial or contingent causation, we must distinguish two degrees, according as *a given* complement is intended or *any* complement whatever.

The more restricted form of negation of partial causation or contingent causation mentions a complement, as in statements like "P1 (complemented by P2) is not a partial cause of Q" or "P1 (complemented by P2) is not a contingent cause of Q," Such negation is feasible if *any one or more* of the four constituent clauses of such causation is deniable. That is, such negation consists of a disjunctive proposition saying "not(i) and/or not(ii) and/or not(iii) and/or not(iv),"

In contrast, note well, the negation of partial causation or contingent causation through statements like "P1 is not a partial cause of Q" or "P1 is not a contingent cause of Q," is more radical. "P1 is not a partial cause of Q" means "P1 (*with whatever complement*) is not a partial cause of Q" – it may thus be viewed as a conjunction of an infinite number of more restricted statements, viz. "P1 (complemented by P2) is not a partial cause of Q, and P1 (complemented by P3) is not a partial cause of Q, and... etc.," where P2, P3, etc. are *all* conceivable complements. Similarly with regard to "P1 is not a contingent cause of Q,"

A restricted negative statement is very broad in its possible outcomes: it may signify that P1 is not a cause of Q at all, or that P1 is instead a complete or necessary cause of Q, or that P1 is a weak cause of Q but a contingent rather than partial one or a partial rather than contingent one, or that P1 is a partial or contingent cause (as the case may be) of Q but with some complement *other than* P2.

A radical negative statement comprises many restricted ones, and is therefore less broad in its possible outcomes, specifically excluding that P1 be involved in a partial or contingent causation (as the case may be) with *any* complement(s) whatsoever. A restricted negation is *relative* to a complement (say, P2); a radical negation is a generality comprising all similar restricted negations for the items concerned (P1, Q), and is therefore relative to *no* complement (neither P2, nor P3, etc.).

The negation of weak causation as such means the negation of both partial and contingent causation, either in a restricted sense (i.e. relative to some complement) or in a radical sense (i.e. irrespective of complement).

This brings us to the relation of **non-causation**, which is also very complex.

As we saw, the positive causative proposition “P is a cause of Q” may be interpreted as “P is a complete or necessary or partial or contingent cause of Q,” Accordingly, we may interpret the negative causative proposition “P is not a cause of Q” as “P is not a complete *and* not a necessary *and* not a partial *and* not a contingent cause of Q,” i.e. as a denial of all four genera of causation in relation to P and Q (with whatever complement).

It is noteworthy that we cannot theoretically *define* non-causation except through negation of all the concepts of causation, which have to be defined first[113]. In contrast, on a practical level, we proceed in the opposite direction: in accord with general rules of induction, we presume any two items P and Q to be without causative relation, until if ever we can establish inductively or deductively that a causative relation obtains between them.[114]

Nevertheless, ‘non-causation’ refers to denial of causation, and is not to be confused with ignorance of causation; it is an ontological, not an epistemological concept.

Note well that non-causation is *not* defined by the propositions “if P, not-then Q, and if notP, not-then notQ,” Such a statement, though suggestive of non-causation, is equally compatible with partial and/or contingent causation; so, it cannot suffice to distinguish non-causation. *To specify a relation of non-causation, we have to deny every determination of causation*.

Furthermore, “P is not a cause of Q” refers to *relative* non-causation – it is relative to the items P and Q specifically, and does not exclude that Q may have *some other* cause P_1, or that P may have *some other* effect Q_1. Two items, say P and Q, taken at random, need not be causatively related at all (even in cases

113 We shall later see that this truism is ignored by some philosophers.

114 The philosophical problems of defining causation (its forms) and identifying specific cases of causation (its contents), are distinct, as we shall see.

where they happen to be respectively causatively related to some third item, as will be seen when we study syllogism in later chapters). In such case, P and Q are called *accidents* of each other; their eventual conjunction is called a *coincidence*.

Relative non-causation is an integral part of the formal system of deterministic causality. We have to acknowledge the possibility, indeed inevitability, of such a relation. If I say: "the position of stars does not affect[115] people's destinies," I mean that there is no causal relation *specifically between* stars and people; yet I may go on to say that stars affect other things or that people are affected by other things, without contradicting myself.

Relative non-causation should not be confused with *absolute* non-causation. The *causelessness* of some item A would be expressed as "nothing causes A," a proposition summarizing innumerable statements of the form "B does not cause A; C does not cause A; etc.," where B, C,... are *all existents other than* A. Similarly, the *effectlessness* of some item A would be expressed as "nothing is caused by A," a proposition summarizing innumerable statements of the form "B is not caused by A; C is not caused by A; etc.," where B, C,... are *all existents other than* A.

We thus see that whereas positive causative propositions are defined by conjunctions of clauses, negative ones are far more complex in view of their involving disjunctions.

The negations of determinations, or the negation altogether of causation, should not themselves be regarded as further determinations, since they by their breadth allow for non-causation (between the items concerned), note.

115 To 'affect' some thing is to cause a change in it.

25. SOME LC PHASE ONE INSIGHTS

Drawn from The Logic of Causation (I:1999-2000), Chapters 3:3 and 10:1-2.

1. The Significance of Certain Findings

Let us review how we have proceeded so far. We started with the paradigm of causation, namely, complete necessary causation. We then abstracted its constituent "determinations," the complete and the necessary aspects of it, and by negation formulated another two generic determinations, namely partial and contingent causation. We then recombined these abstractions, to obtain all initially conceivable formulas. Some of these formulas (**mp**, **nq**) could be eliminated as logically impossible by inspecting their definitions and finding contradictory elements in them. Others (the *lone* determinations, obtained by conjunction of only one generic determination and the negations of all three others) were eliminated on the basis of later findings not yet presented here. This left us with only five logically tenable specific causative relations between any two items, namely the four *joint* determinations (the consistent conjunctions generic determinations) and non-causation (the negation of all four generic determinations).

When I personally first engaged in the present research, I was not sure whether or not the (absolute) lone determinations were consistent or not. Because each lone determination involves three negative causative propositions in conjunction, and each of these is defined by disjunction of the negations of the defining clauses of the corresponding positive form, it seemed very difficult to reliably develop matrixes for them. I therefore, as a logician[116], had to assume as a working hypothesis that they were

116 The logician must keep an open mind so long as an issue remains unresolved. Logic cannot at the outset, without good reason, close doors to alternatives. Where formal considerations leave spaces,

logically possible. It is only in a later phase, when I developed "matricial microanalysis" that I discovered that they can be formally eliminated. Take my word on this for now. This discovery was very instructive and important, because it signified that *causation is more "deterministic" than would otherwise have been the case*.

If lone determinations had been logically possible, causation would have been moderately deterministic. For two items might be causatively related on the positive side, but not on the negative side, or vice-versa. Something could be *only* a complete cause (or *only* a partial cause) of another without having to also be a necessary or contingent one; or it could be *only* a necessary cause (or only a contingent cause) of another without having to also be a complete or partial one. But as it turned out there is logically no such degree of freedom in the causative realm.

If two things are causatively related at all, they *have to be* ultimately related in one (and indeed only one) of the four ways described as the joint determinations[117], i.e. in the way of **mn**, **mq**, **np**, or **pq**. The concepts **m**, **n**, **p**, **q** are common aspects of these four relations and no others. There is no "softer" causative relation. Causation is "full" or it is not at all; no "holes" are allowed in it. We can formulate the following "laws of causation" in consequence:

- If something is a complete or partial cause of something, it must also be either a necessary or (with some complement or other) a contingent cause of it.

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we cannot impose prejudices or speculations. The reason being that the aim of the science of logic is *to prepare the ground for discourse and debate*. If it takes arbitrary 'metaphysical' positions at the outset, it deprives us of *a language* with which to even consider opposite views. So long as formal grounds for some thesis is lacking, its antithesis must remain utterable.

117 It is interesting to note that, although J. S. Mill did not (to my knowledge) consider the issue of lone determinations, he turned out to be right in acknowledging only the four joint determinations.

- If something is a necessary or contingent cause of something, it must also be either a complete or (with some complement or other) a partial cause of it.
- In short, since a lone determination is impossible, if something is at all a causative of anything, it must be related in the way of a joint determination with it.

These laws have the following corollaries:

- If something is neither a necessary nor contingent cause of something, it must also be neither a complete nor (with whatever complement) a partial cause of it.
- If something is neither a complete nor partial cause of something, it must also be either neither a necessary nor (with whatever complement) a contingent cause of it.
- In short, since a lone determination is impossible, if two things are known not to be related in the way of either pair of contrary generic determinations (i.e. **m** and **p**, or **n** and **q**), they can be inferred to be not causatively related at all.

Also:

- The *complement* of a partial cause of something, being also itself a partial cause of that thing, must either be a necessary or (with some complement or other) a contingent cause of that thing.
- The *complement* of a contingent cause of something, being also itself a contingent cause of that thing, must either be a complete or (with some complement or other) a partial cause of that thing.

With regard to the epistemological question, as to how these causative relations are to be established, we may say that they are ultimately based on ***induction*** (including deduction from induced propositions): we have no other credible way to knowledge. Causative propositions may of course be built up gradually, clause by clause (see definitions in the previous chapter).

As I showed in my work *Future Logic*, the *positive* hypothetical (i.e. if/then) forms, from which causatives are constructed, result

from generalizations from experience of conjunctions between the items concerned (which generalizations are of course revised by particularization, when and if they lead to inconsistency with new information). The *negative* hypothetical (i.e. if/not-then) forms are assumed true if no positive forms have been thus established, or are derived by the demands of consistency from positive forms thus established. In their case, an epistemological quandary may be translated into an ontological *fait accompli* (at least until if ever reason is found to prefer a positive conclusion).

We may first, by such induction (or deduction thereafter), propose one of the four generic determinations in isolation. The proposed generic determination is effectively treated as a joint determination "in-waiting," a convenient abstraction that does not really occur separately, but only within conjunctions. We are of course encouraged by methodology to subsequently **vigorously research** which of the four joint determinations can be affirmed between the items concerned. In cases where all such research efforts prove fruitless, we are simply left with a *problematic* statement, such as (to give an instance) "P is a complete cause, and either a necessary or a contingent cause, of Q,"

But, since lone determination does not exist, we can never opt for a *negative* conclusion, like "P is a complete cause, but neither a necessary nor a contingent cause, of Q," We may *not* in this context effectively generalize from "I did not find" to "there is not" (a further causative relation). We may not interpret a structural doubt as a negative structure, an uncertainty as an indeterminacy.

In the history of Western philosophy, until recent times, the dominant hypothesis concerning causation has been that it is applicable *universally*. Some philosophers mitigated this principle, reserving it for 'purely physical' objects, *excepting* beings with volition (humans, presumably G-d, and even perhaps higher animals). A few, notably David Hume, denied any such "law of causation" as it has been called.

But in the 20th Century, the idea that there might, even in Nature (i.e. among entities without volition), be 'spontaneous' events

gained credence, due to unexpected developments in Physics. That idea tended to be supported by the Uncertainty Principle of Werner Heisenberg for quantum phenomena, interpreted by Niels Bohr as an ontological (and not merely epistemological) principle of indeterminacy, and the Big-Bang theory of the beginning of the universe, which Stephen Hawking considered as possibly implying an *ex nihilo* and non-creationist beginning.

We shall not here try to debate the matter. All I want to do at this stage is stress the following nuances, which are now brought to the fore. The primary thesis of determinism is that ***there is causation*** in the world; i.e. that causal relations of the kind identified in the previous chapter (the four generic determinations) ***do occur*** in it. Our above-mentioned discovery that such causation has to fit in one of the four specific determinations may be viewed as a corollary of this thesis, or a logically consistent definition of it.

This is distinct from various universal causation theses, such as that nothing can occur except through causation (implying that causation is the only existing form of causality), or that at least nothing in Nature can do so (though for conscious beings other forms of causality may apply, notably volition), among others.

We shall analyze such so-called ***laws*** of causation in a later chapter; suffices for now to realize that they are extensions, attempted generalizations, of the apparent ***fact*** of causation, and not identical with it. Many philosophers seem to be unaware of this nuance, effectively regarding the issue as either '*causation everywhere*' or '*no causation anywhere*'.

The idea that causation is present ***somewhere*** in this world is logically quite compatible with the idea that there may be ***pockets*** or ***borders*** where it is absent, a thesis we may call 'particular (i.e. non-universal) causation'. We may even, more extremely, consider that causation is poorly scattered, in a world moved principally by spontaneity and/or volition.

The existence of causation thus does *not* in itself exclude the spontaneity envisaged by physicists (in the subatomic or astronomical domains); and it does *not* conflict with the

psychological theory of volition or the creationist theory of matter[118].

Apparently, then, though determinism may be the major relation between things in this world, it leaves some room, however minor (in the midst or at the edges of the universe), for indeterminism.

We will give further consideration to these issues later, for we cannot deal with them adequately until we have clarified the different modes of causation.

2. Highlights of Findings

I will stop the first phase of my research on the logic of causation at this point. Not just because I do not think it is worth going further into minutiae. I in fact do not consider that all the important formal issues have been covered. However, I do regard the logical techniques applied so far to have come close to the limits of their utility. That is why I have been developing more precise techniques, which I will publish eventually as Phase Two. Let us meanwhile review some of our main findings thus far in Phase One, and what information we are still missing.

We have succeeded in **defining** the various determinations of causation, by means of propositional forms already known to logic. These forms involve conjunctions (‘and’), conditionings (‘if-then’), modalities (‘possibly’, ‘actually’), and of course negations of all those (‘not’).

The mechanics of these various source forms are thoroughly treated in my work *Future Logic*, and need not be reviewed here.

118 Note incidentally that to say that G-d created the world does not imply that He did so specifically as and when the Bible seems to describe it; He may equally well have created the first concentration of matter and initiated the Big-Bang. Note also, that Creationism implies the pre-existence of G-d, a 'spiritual' entity; it is therefore a theory concerning the beginning of 'matter', *but not of existence as such*. G-d is in it posited as Eternal and Transcendental, or prior to or beyond time and space, but still 'existent'. With regard to such issues, including the compatibility of spontaneity and volition with Creation, see my *Buddhist Illogic*, chapter 10.

Since we already know the **deductive** properties of these underlying forms (how they logically interact) and how they can ultimately be **induced** from experience (abstraction, adduction, generalization and particularization, factorial analysis, factor selection and formula revision), these formal problems are *in principle already solved* for causative propositions. It is only a question of finding ways and means to extract the implicit information systematically and reliably.

I have tried to perform just this job in the preceding pages. The difficulties encountered are never such as to put the whole enterprise in doubt, note well. They are only due to the *complexity of forms involved*, since each positive causative is a conjunctive compound of several simpler forms, and all the more so in the case of negative propositions, which are disjunctive compounds of such simpler forms. The main problem is thus one of *volume of information to be treated*; there is so much data to sort out, order and organize, that we can easily get lost, forget things, make minor errors with numerous hidden repercussions.

I am only human, and may well have made some mistakes in this process. A major annoyance for me is that I am often forced to interrupt my research work due to the need to earn my living by other means. In such circumstances, my attention is diverted for long periods; my mind loses its thorough concentration on the subject matter, and I have to later re-learn it all. Hopefully, I have nevertheless succeeded in spotting and removing all eventual inconsistencies. Certainly, I have tried: always making consistency checks, painstakingly reviewing large bodies of data and long chains of reasoning, doing what I call "quality control,"

The best way to do this is to arrive at the same results using different means. That is one reason why, although the above Phase One work apparently stands up well on its own, I will not be entirely satisfied until Phase Two is complete and I arrive there at consistent results. But to return for now to our findings thus far…

It must be understood that this research has not been idle reshuffling of information and symbols. It had *both practical and theoretical* purposes in mind.

The practical questions relate to everyday reasoning about causes and effects. One of the principal questions we posed, you will recall, was *whether the cause of the cause of something is itself a cause of that thing or not, and if it is, to whether it is so to the same degree or a lesser degree*. This issue of causal (or effectual) chains is what the investigation of causal syllogism is all about. What our dispassionate research has shown is that it is absurd to expect ordinary reasoning, unaided by such patient formal reflections, to arrive at accurate results. The answer to the question about chains is resounding and crucial: **the cause of a cause is not necessarily itself a cause, and if it is a cause it need not be one to the same degree**. Once the scientific impact of this is understood, the importance of such research becomes evident.

But this syllogistic issue has not been the only one dealt with. We have in the process engaged in many other investigations of practical value. The definitions of the determinations causation by means of **matrixes** can help both laypeople and scientists to classify particular causative relations, simply by observing conjunctions of *presences and absences of various items*. Generalizations may occur thereafter, but they should always be checked by further empirical observation (at least, a readiness to notice; eventually, active experiment) and adjusted as new data appears (or is uncovered).

Another interesting finding has been the clarification of the relationships between positive and negative, absolute and relative causative propositions: for instance, that **we may affirm partial or contingent causation, while denying it of a particular complement**. One very important principle – that we have assumed in this volume, but not proved, because the proof is only possible in the later phase of research – is that *(absolute) "lone determinations" are logically impossible*. This means that we may in practice consider that **if there is causation at all, it must be in one or the other of the four "joint" determinations**.

Another finding worth highlighting is that **non-causation is denial of the four genera (or four species) of causation**, and before these can be definitely denied we have to go through a long process of empirical verification, observing presences and absences of items or their negations in all logically possible conjunctions. It is thus in practice as difficult to prove non-causation as to prove causation! Indeed, to be concluded the former requires a lot more careful analysis of data than the latter. Of course, in practice (as with all induction) we assume causation absent, except where it is proved present. But if we want to check the matter out closely, a more sustained effort is required.

With regard to the theoretical significance of our findings, now. By theoretical, here, I mean: relevant to philosophical discussions and debates about causality. Obviously, so far we have only treated causation, and said nothing about volition and allied cause-effect relations, so we cannot talk about causality in its broadest sense.

What our perspective makes clear is that **the existence of "causation" is indubitable**, once we apprehend it as a set of experiential yes or no answers to simple questions, leaving aside references to some underlying "force" or "connection" (which might be discussed as a later explanatory hypothesis). If we look upon causation in a positivistic manner, and avoid metaphysical discussions that tend to mystify, it is a simple matter. *Causation is an abstraction, in response to phenomenologically evident data*. It is a summary of data.

It is not purely empirical, in the sense of a concept only summarizing *presences* of phenomena. It involves a rational element, in that it also summarizes *absences* of phenomena. Affirmation may only be acknowledgment of the empirically apparent. But negation, as I have stressed in my work *Phenomenology*[119], is a partly rational act (a question is asked: is the thing I remember or imagine now present to my senses?), as well as a partly empirical act (the answer is no: I see or hear

119 This final chapter of Phase One was written in 2003, after publication of *Phenomenology*.

or otherwise sense nothing equivalent to that image!). Absence does not exist independently like presence, but signifies an empirically disappointed mental expectation.

Reading debates between philosophers (for example, David Hume's discussions), one might get the impression that non-causation is an obvious concept, while causation needs to be defined and justified. But, as we have seen here, *non-causation can only be understood and proven with reference to causation*. Before we can project a world without causation, we have to first understand what we mean by causation, its different determinations, their interactions, and so forth. But the moment we do that, the existence of causation is already obvious. However, this does not mean that non-causation does not exist. Quite the contrary. Since, as we have seen, some formal processes like syllogism with premises of causation are inconclusive, we may say that the existence of causation implies that of non-causation! This finding has two aspects:

(a) The more immediate aspect is inferred from the fact that the cause of a cause of something is not necessarily itself a cause of it: **taking any two things at random, they may or not be causatively related**. This implication is valuable to contradict the Buddhist notion that "everything is caused by everything," But the possibility of independence from *some* things does not exclude dependence on *other* things. Each of the two things taken at random may well have other causes and effects than each other.

(b) A more radical aspect is the issue of spontaneity, or no causation *by anything at all*. We can only touch upon this issue here, since we have only dealt with causation so far. But what our formal study of causation has made clear is that we cannot say offhand whether or not spontaneity in this sense is possible. **There is no "law of causation" that spontaneity is impossible**, i.e. that "everything has a cause," as far as I can see. Nothing we have come across so far implies such a universal law; it can only be affirmed by generalization. Spontaneity (chance, the haphazard) remains conceivable.

I think the point is made: that formal research such as the present one has both practical and theoretical value. Let us now explain why the research undertaken so far is insufficient.

3. The Modes of Causation

The observant reader will have noticed that throughout the present study we have concentrated on **logical causation**, i.e. on causative propositions based on logical conditioning. But of course, this is but one aspect of human aetiological reasoning. To be thorough, we need to consider not only such "*de dicta*" forms, but also the "*de re*" modes of causation, i.e. **natural, temporal, extensional and spatial causation**. In many ways, the latter are more interesting than the former. We have focused our attention on logical causation because it is the most widely known theoretically, although not necessarily the most widely used in practice.

Each of these modes of causation is derived on one of the modes of conditioning. A thorough study of the underlying forms of conditioning may be found in my work *Future Logic* (Part IV, Chapters 33-42)[120]. What is evident from that study is that natural, temporal, extensional and spatial conditioning, are in most respects similar to logical conditioning, but in significant respects different. The difference is essentially due to the fact that logical conditional propositions (like "if P then Q") distinctively cannot be made to universally imply the "bases" (i.e. "P is possible, Q is possible") – *because if they were made to, we would not be able to express paradoxes*[121]. From this structural difference, various differences in behavior (during inference) emerge.

However, this distinction dissolves in the context of causation, because here logical causation like all other types implies the bases. We have specified this fact as the

120 I do not there treat *spatial* modality, but it is easy enough to do eventually.

121 In paradox, either P or Q is implied impossible. See *Future Logic*, chapter 31.

last clause of each of the definitions of the determinations. Complete or partial causation implied the cause, or the conjunction of causes, and therefore the effect, to be possible; necessary and contingent causation implied them to be unnecessary. It follows that all the logical properties of the different modes of causation will be comparable. The subdivision of each mode of causation into different determinations will be the same, as will the underlying interplay of presences and absences, possibilities and impossibilities, in every conceivable combination and permutation. All the matrixes of their forms will be identical, and all arguments will have the same conclusions.

The only difference between these different logics is simply that the "possibility" and "impossibility" referred to in the definitions and matrices have a different sense in each case. In logical causation, they refer to logical modalities; in natural causation, to natural modality; in extensional causation, to extensional modality; and so forth. The only task left to logicians, therefore, is to more closely examine the interrelationships between these different modes of causation. That is, for instance, how any two natural and extensional causative propositions are opposed to each other, and how they behave in combination (i.e. within arguments). This complex work will not be attempted here.

Nevertheless, I have already in *Future Logic* clarified the following essential relationships. Logical necessity implies but is not implied by the *de re* necessities. Logical possibility is implied by but does not imply the *de re* possibilities. Similarly on the negative side, for impossibility and unnecessity. Thus, the logical mode lies on the outer edges of rectangles of oppositions including the *de re* modes.

For now, let us only clarify in what context each mode is used. Logical (or *de dicta*) causation is concerned with causes in the literal sense of "reasons;" that is to say, it helps us to order our discourse and eventual knowledge with reference to logical implications, presuppositions, disconnections, contradictions, or

consistencies, between hypotheses and/or apparent evidences. In contrast, the *de re* modes of causation are more directly object-oriented.

- The paradigm of *natural* causation is:

  When the individual X *actually* is, has or does C (the cause),

  then it (or some other individual Y) must (i.e. in all circumstances) be, have or do E (the effect);

  and when C is not actual, neither is E.

In this context, C and E are qualities, properties or activities of any sort, relative to some *individual* entity X (or pair of individuals X, Y, respectively). Presence, here, is called "actuality" to refer us to the underlying natural modality. Necessity, here, means *in all circumstances* relative to this X in the antecedent. The implied basis of such propositions is that "this X can both C and E" (or "X+C and Y+E is potential for the individual(s) concerned," as appropriate) – no need of additional clauses in that respect. The antecedent and consequent may be static or dynamic, and may or may not be temporally separated.

- The paradigm of *temporal* causation is very similar, save that "must" becomes "always" (all units of time) in the body of time concerned. The form is "When… at some time, then… at all times,"
- The paradigm of *extensional* causation is a bit different:

  In such cases as class X *in some instance* is, has or does C (the cause),

  then it (or another instance of class X or an instance of some other class Y) must (i.e. in all instances) be, have or do E (the effect);

  and in such cases as C does not have an instance, neither does E.

In this context, C and E are qualities, properties or activities of any sort, relative to some *class* of entities X (or pair of classes X, Y, respectively). Presence, here, is called "instancing" to refer us to the underlying extensional modality. Necessity, here, means *in all instances* of X in the antecedent. The implied basis of such propositions is that "some X are both C and E" (or "X+C and Y+E is extensionally possible for the class(es) concerned,"

as appropriate) – no need of additional clauses in that respect. The antecedent and consequent may be static or dynamic, and may or may not be temporally separated. *They distinctively need not be actualities, but may be potentialities or necessities*, note well, since extensional conditioning refers only to quantity.

The paradigm of *spatial* causation is very similar, except that "must" becomes "everywhere" (all units of space) in the body of space concerned. The form is "Where… at some place, there… at all places,"

What I want to make sure here is that the reader understands that there are different modes of causation, and that the differences between them are significant to ordinary and scientific thought or discourse.

For example, the theory of Evolution is based partly on observation or experiment on *individual* biological specimens (spatial, temporal and natural causation) and partly on putting together the jigsaw puzzle of scattered findings relating to *a class* of individuals in different times and places (extensional causation), as well as partly on theoretical insights about consistency and implications between postulates and experiences (logical causation). All these involve induction and deduction, hypothetical reasoning and generalizations, but their focal center changes.

When, for instance, we take note of the structural or even genetic similarities of all vertebrates, and presume them to have a common ancestor, we are engaged in *extensional* causative reasoning. We would be engaged in *natural* causative reasoning, only if we could trace the ascendancy from individual child to individual parent all the way back to the first vertebrate specimen. In the extensional mode, the different individuals (e.g. paleontological findings) are regarded as expressions of a single class (genus, species, variation, whatever). In the natural mode, our focus is on the life of individuals as such (irrespective of their class appurtenance).

People, and even scientists, often confuse these different ways of thinking, and remain unaware that **they may lead to different conclusions, or at least nuance our conclusions considerably**.

For this reason, the study of the modes of causation needs to be carried out in appropriate detail.

26. Some LC Phase Two Insights

Drawn from The Logic of Causation (II:2003-05), Chapter 16:2-4.

In this chapter, my purpose is to break some additional ground, discussing certain outstanding issues in causation without attempting to exhaust them at this time.

1. On Laws of Causation

The expression 'law of causation' can also be applied to each and every theorem we have proved concerning causation. All our reductions of causative propositions to simpler conjunctive or conditional propositions, or to specified alternative moduses, all the immediate or syllogistic inferences from causative propositions that we have established, constitute so many 'laws' about causation.

The 'grand matrices', of 15 possible moduses for any two items, or 255 possible moduses for three items, or 65,535 possible moduses for four items, and so forth, may be viewed as the nearest thing to *a universal law of causation* that we can formally guarantee:

> ***Any*** **two or more items** ***must*** **be related by some modus(es) within these frameworks, although the modus(es) by which they are related are** ***not*** **necessarily those of causation (or prevention).**

The only alternative modus that is formally impossible is the one in each framework (labeled No. 1) consisting entirely of zeros: this the laws of thought interdict in advance for all items. Two (or more) items are always 'tied together' by one or more of moduses (each of which can be visually imagined as a sort of ticker-tape in which zeros and ones are punched), but we cannot

predict how many and precisely which moduses are effective for that particular pair of items (or more).

A grand matrix represents all the ways that any two (or more) items might *in principle*, i.e. from an epistemological perspective, at first sight, be found to co-exist or not co-exist. But *in practice*, from an ontological point of view, after thorough research, not all these ways are applicable in every case: in each given case, only some alternative moduses are likely to be applicable.

As previously discussed[122], we can group the alternative moduses in various ways, according to what sort of relationship they signify between the items concerned. We can thus distinguish between 'connective' relationships (causation or prevention) and 'non-connective' relationships (one or more items incontingent), as shown in the table below for two items.

In one case, **the last modus of any grand matrix (that involving only '1' codes)**, i.e. modus #16 in a two-item framework (conventionally classified as absolute partial and contingent causation or prevention, i.e. the form $\mathbf{p}_{abs}\mathbf{q}_{abs}$), **we cannot strictly say whether connection or nonconnection is ultimately involved** (i.e. when more items are eventually taken into account, in a larger grand matrix). So, this modus might be placed under either heading, or under neither of them[123].

122 See Chapter 13.2.

123 Note well that this is a relatively late realization of mine, in Chapter 13.2: that the last modus is not necessarily always to be interpreted as signifying causation; it is only indicative of possible causation. Consequently, my classification of the 2-item modus #16, or the 3-item modus #256, etc., under the heading of causation was not accurate and could be misleading. It should more precisely be classified as 'indefinite'.

Table 26.1. Possible relations between any two items P and R.

Relationship		**Modus Nos.**
Connection between P and R		*7-8, 10, 12, 14-15, (16)*
Causation by P of R		10, 12, 14, (16)
Prevention by P of R		7, 8, 15, (16)
Non-connection between P and R		*2-6, 9, 11, 13, (16)*
Both P and R are incontingent		2, 3, 5, 9
P impossible	R impossible	2
P impossible	R necessary	3
P necessary	R impossible	5
P necessary	R necessary	9
Only one of P or R is incontingent		4, 6, 11, 13
P incontingent	R contingent	4, 13
P contingent	R incontingent	6, 11
Indefinite regarding connection or nonconnection		***16***

Some groups of alternative moduses signify incontingency (necessity or impossibility) of one (or more) of the items concerned, while the others signify contingency of the two (or more) items concerned. An incontingent item is independent of all others. Only where all items involved are contingent can causation or prevention (i.e. some connection) occur between them. Different combinations of moduses have been identified as different determinations of causation or prevention. These determinations have been classified in various hierarchies and polarities: strongs/weaks, absolutes/relatives, generics/joints/lones, positives/negatives, causative/preventive,

each of which is signified by a certain group of moduses. But contingency of all items does not signify their connection.

Having thus put matricial analysis in perspective, it is easier for us to evaluate on purely formal grounds certain philosophical claims for or against causation that have arisen over the centuries. We shall here use the word 'cause' in the specific sense of causative connection, including in it both causation and prevention, but excluding other causal relations (such as volition). As we shall see, *none* of these claims can be *formally* established from our definitions of causation and all the properties of causation emerging from them.

1. Some philosophies have claimed that ***everything has a cause***. This is commonly referred to as 'the law of universal causation' and is the position most widely adhered to. It is a claim that causation is to be found everywhere, that all things are ruled by it – i.e. that every single thing is caused by some other things, themselves in turn caused by others, and so forth *ad infinitum*. There are different versions of this proposed law, "nothing is without cause,"

a) Oriental philosophies would opt for a *radical* interpretation, based on the belief that all things in the empirical world (*dharmas*) are impermanent, so that nothing exists that is independent. Clearly, this viewpoint eliminates a certain number of alternative moduses (those signifying incontingency) from consideration at the outset: but no formal grounds for such a narrowing of scope have been proposed. Indeed, if one reflects, the claim in question is *self-contradictory*, since it is itself put forward as a permanent fact, a necessity. So, we can on *formal* grounds reject it.

b) Most Western advocates of universal causation would more *moderately* understand it as "nothing *contingent* is without cause," They would allow that some things are necessary or impossible, but consider that those things which are possible but not necessary have to have a cause. It is important thing to realize that, contrary to what many of its advocates believe, this alleged law *cannot be formally deduced* from the definitions of causation. It is only conceivable on

inductive grounds, by *generalization* from previously encountered cases.

Note that, unlike the radical version, the moderate version of universal causation is not inconsistent and does not prejudicially exclude any alternative moduses. What it does exclude at the outset, in advance of empirical research and without formal proof, is that some contingent item may exist that has no causative (or preventive) relation to at least one other item in the universe.

2. Some philosophies have claimed that ***nothing has a cause***. We may cite as proponents: in the East, the Indian philosopher Nagarjuna (2nd Cent. CE), and in the West, the Scottish philosopher David Hume (18th Cent.). This viewpoint is essentially a denial that there is any such relation as causation; it is a claim that the concept is meaningless, a human invention without corresponding reality, an error of reasoning. Here again, we could distinguish a *radical* version, which excludes incontingency in principle and so is internally inconsistent, and a *moderate* version, which reserves indeterminacy to contingents.

Either way, the negative thesis that 'nothing is causatively related to anything else' *arbitrarily eliminates for any two (or more) items the vast majority of alternative moduses*: all those signifying causation or prevention, and does so *for all items* past, present or future, everywhere in the universe. It gives no formal ground for such a sweeping measure, but bases it on denial of the possibility of conceptualization or generalization. This may be claimed as an empiricist posture, or may be coupled with skepticism about perceptual evidence. But, since any such claims themselves use concepts and appeal to generalities that could only be admitted by granting generalization, they are *self-contradictory* and therefore logically untenable.

The antagonists of causation attempt to mitigate this paradox by claiming that causative propositions are "conventional" (Nagarjuna) or "habitual" (Hume), ignoring that such *explanations* themselves rely on admission of the causative relation. Some instead argue that though causation may be theoretically meaningful, it is impossible to establish in practice.

But as shown in the present work, a concept of causation *can* readily be constructed, using indubitable simpler concepts of presence, absence, conjunction and disjunction, possibility and impossibility. Moreover, the concept would have to be convincingly defined, before it could be declared empty! So, it cannot be meaningless. As for the fear that causative relations have no actual instances or are in practice unknowable, we shall now explain it.

The deep reason for such antagonisms is the failure to understand causative propositions as simply *records of conjunctions of presences and/or absences* of two (or more) items. Such summaries are generalized from observation, subject to corrective particularization if new observation belies them. The antagonists have not emotionally reconciled themselves to the *tentative, inductive* nature of knowledge, and so set up and cling to badly defined and impossible deductive ideals of knowledge (without noticing that they themselves cannot possibly satisfy them).

Causative judgment is indeed based not only on empirical evidence, but also on ordering of information by the rational faculty, since it concerns not only presence but also absence, and all negation involves rational projection. This however only means that reason provides an 'overlay' (the grand matrix) through which to order (summarize and predict) events, but the evidence this overlay is laid over (i.e. the 1s and 0s exhibited by the items, the moduses applicable in their case) is empirical (ultimately, though we may thereafter get to know some by immediate or syllogistic inference from previous experiences).

3. Some philosophies have claimed that ***some things have a cause and some things do not have any cause***. This position gained acceptance among physicists and consequent popularity in the 20th Century, after the advent of quantum mechanics (as interpreted by Niels Bohr) and Big-Bang astronomy (Stephen Hawking seems to advocate that the apparition of matter and its primeval explosion were simultaneous and causeless). This position, note well, is a compromise between the preceding two.

It admits of non-causation[124] in specific areas (the beginning of time) or at certain levels (the subatomic), together with causation in all other cases or situations. This position is formally neither provable nor disprovable: it is consistent and does no violence to matricial analysis.

It is neither more nor less conceivable than the (moderate) 'universal causation' thesis. They are simply – equally conceivable contrary hypotheses or predictions. Each of these two theses must be viewed as an epistemological postulate or an ontological generalization. 'Universal causation' is a generalization from cases where causation was apparently (after certain generalizations) found, to cases where it is *not yet* found; whereas 'particular causation and particular noncausation' emphasizes the cases where we have not yet found a credible cause, and suggests that we generalize this failure to 'no cause *will ever be* found, because none exists'.

A grand matrix, remember, foresees every conceivable way two or more items *might* appear together or apart (refer Table 16.1 above). To establish that a given item has ***some*** cause, it suffices that we find ***one other*** item that has a relationship of connection with it (two-item moduses #s 7-8, 10, 12, 14-15, and some cases of #16). But to establish that a given item has ***no*** cause is much more difficult! It is not sufficient to show that one other item is not its cause (two-item moduses 2-6, 9, 11, 13, and some cases of 16): one has to show that this is true of ***all other*** items.

Obviously, for those of us who make no claim to omniscience, this is an impossible task. We can only – either appeal to a law of universal causation or accept the possibility that some things are causeless. In any case, generalization is doubly involved: first, in the inductive proof that any modus is applicable to the set of items observed; second, in the inductive passage from those items to items not observed. Denying *both* these principles is not a viable third alternative, as already explained.

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124 This refers to *absolute* noncausation, which is not to be confused with *relative* noncausation: it means *no cause whatsoever*, and not merely *not this specified cause*.

To repeat, neither of the coherent doctrines can be proved or disproved deductively; they are neither self-evident nor self-contradictory. They may only conceivably be established inductively, through generalization from respectively "we have found causes for everything encountered so far" (which is far from the case) or "there are things for which no causes have so far been found" (which is true, but since "there are things for which causes have eventually been found" is also true, we are inhibited from quick generalization). There is a standoff.

Since no formal ground for either position is evident, the science of Logic must make formal allowance for *both* positions. Its task is to provide the formal means for open-minded debate of this topic (as of all others): it cannot prejudicially exclude the one or the other from language and block discourse in advance.

It is important to be clearly aware where in a grand matrix causelessness or spontaneity is allowed for. Refer to the last three rows of Table 16.1 above, where one or both items are contingent, yet the moduses of causation or prevention do not apply to them. If item R is the contingency under scrutiny, our table implies that R *might* be without cause if its relation to P falls under modus 4 or 13 or under modus 16. For an item to certainly *be* causeless, it would have to have one of these relations not only to P, but also to all other items in the universe – P1, P2, P3, etc.

Absolute noncausation of R can be expressed in the form "**nothing causes R**," which collects together innumerable statements of relative noncausation, of the form "P does not cause R; P1 does not cause R; P2 does not cause R; etc.," where P, P1, P2,... are *all existents other than* R.

Now, to formally deny that there exists anything such that nothing causes it, one would have to find an inconsistency in the said mass of statements, or in their summing up in one sentence. No such inconsistency arises. Therefore, we have to admit absolute non-causation as a formal possibility, i.e. as at least *conceivable*. It may still be factually false, i.e. there may indeed be no such animal. The issue must therefore remain open; that is, formal logic may and must proceed without resolving it.

Epistemology and ontology may still, nevertheless, postulate the one or other position with reference to wider considerations.

With regard to the question: what would the relationship be between the causation apparent at the level of our ordinary sensory experiences and the spontaneity assumed by physicists to be operative at a deeper, subatomic level (known indirectly, by postulates and experimental observations) – the answer is simple enough. It is the relationship implied by a dilemmatic argument like "**whether X or Y occurs, nevertheless Z is bound to occur**" – that is: whether X or Y blossoms spontaneously at the subatomic level, *they both have the same effect Z, or equally fail to affect Z*, at the commonplace level. Here, X and Y may refer to events underlying Z, or to magnitudes or degrees of certain events (namely, velocity and position), whose average result is equally Z or of which Z remains independent. Thus, the deeper level may be open to spontaneity while the more superficial level remains governed by causation, without any incoherence being implied.

2. Interdependence

The universal causation doctrine predicts that every existent has *at least some causative relation(s)* to some other existents. This is usually understood in a moderate sense as *only some other things* cause each thing, but Buddhism understands it more extremely as *all other things* cause each thing. This 'universal universal causation' is referred to as the **interdependence** (or codependence) of all things.

We normally suppose that only the past and present can cause the present or future; and indeed, this principle should primarily be read that way. But some might go further and claim that time is transcended by causation, and that literally everything causes everything; I am not sure Buddhism goes to that extreme. Note also that, in truth, Buddhism intends its interdependence principle restrictively, as applicable only to *dharmas*, i.e. the transient phenomena constituting the world of appearances; in the higher or deeper realm of the quiescent and undifferentiated "original ground" there is no causation.

Be it said in passing, this version of "karmic law" must be distinguished from the narrower statement, which most of us agree with, that *actions have consequences*. The latter does not imply the former! More deeply, I think what the Buddhists really meant by their law of karma was that each human (or other living) being is somewhat locked within recurring behavior patterns, very difficult (or impossible) to get out of. This is another issue, concerning not causation but volition.

That is the sense of "the wheel": our cultural and personal habits as well as our physical limitations, keep influencing our behavior and are reinforced by repetition. Much meditation and long-term corrective action are required to change them; they cannot be overcome by immediate measures, by a sheer act of will. We are thus burdened by a "baggage" of karma, which we carry out through our lives with usually little change; it may be lightened with sustained effort, but is more likely to be made heavier as time passes.

If we logically examine the claim that "everything causes everything," we see that if everything is causatively connected to everything else, then nothing is without such connection to any other thing, let alone without causative connection to anything whatsoever. That is, this doctrine is effectively *a denial that relative as well as absolute noncausation ever occurs*, which no one in Western culture would admit. To evaluate it objectively, let us look back on the findings in the present volume.

First, in defense of the idea of interdependence, it should be recalled that when we discussed the significance of the "last modus" in any grand matrix (modus #16 for two items, or #256 for three, etc.), which declares any combination of the items concerned or their negations as *possible* (code 1 in every cell of the modus), we saw that there was an uncertainty as to whether this indicated causation (or more broadly, connection) or its absence. If the last modus could be shown on formal grounds to indicate causation in *all* cases, then all contingents in the universe would have to be considered as causatively related to all others (i.e. *any two contingents taken at random* could be affirmed as causatively related, specifically in the way of the partial contingent determination, **pq**).

However, since such formal demonstration is lacking, and the idea is anyway disagreeable to common-sense (at least that of non-Buddhists), we estimated that the science of Logic had to keep an open mind and grant the possibility of the alternative interpretation, namely that two items may or may not be causatively related to each other (i.e. relative noncausation is possible), and moreover that spontaneity (i.e. absolute noncausation) is at least conceivable in some cases. However, in this context, the Buddhist thesis of interdependence, remains a legitimate formal postulate. But note well, only a possible alternative hypothesis; and not a very probable one for most observers (those of us who believe in freewill, for example; as well as physicists who reify the Heisenberg Uncertainty Principle).

An important formal criticism we can level against the notion of interdependence is to ask what manner or degree of causation is meant by it. The term 'causes' in 'everything causes everything' is used very vaguely. Is only causation intended, to the exclusion of volition? And if causation is intended, surely this is meant broadly to include prevention? And are the different determinations of causation admitted, i.e. strong (complete and/or necessary) as well as weak (partial and/or contingent)? The definition of causation traditionally (e.g. in the *Majjhima Nikaya sutra*) attributed to the Buddha is:

> *"When this is, that is; this arising, that arises. When this is not, that is not; this ceasing, that ceases.*

This definition would suggest that only complete necessary causation is intended. But other discussions within Buddhism suggest that this definition is only intended as a paradigm, as the most obvious case, and partial and contingent causation is also in practice admitted, as use of the plural in the expression "causes and conditions" testifies. We may regard prevention as formally subsumed by all these concepts, by negation of an item. Some discourses also seem to accept volition, but this need not concern us here. Focusing, then, on causation in a broad sense, we may make the following criticism.

If everything is causatively related to everything else, then *the only conceivable kind of causation would be weak (both partial and contingent)*. For strong causation (complete and/or necessary) surely implies a certain exclusiveness of relationship between the items. If all items are involved to some degree in the existence of a given item, then none of those causes can be claimed to predominate. So finally, it seems to me, this Buddhist doctrine of multilateral causation requires all bilateral causative relations to be weak, and ultimately abandons strong determinations (including mixtures), and all the more so the strongest determination (which it originally rightly claimed as the definition of causation).

One way to show that the interdependence theory implies specifically a 'universal weak link' is as follows. If we claim interdependence to apply indiscriminately to *all* 'things', i.e. not only to experiential things (*dharmas*), but also to abstract things, we fall into *formal* difficulties as soon as we suppose some causative relations to be strong. For then such abstract relations (i.e. causations) also count as 'things', and are therefore subject to interdependence. We might thus ask how a cause can be complete or necessary when that relationship is itself dependent on some yet other cause: we are forced to contradict our premise and conclude that the cause is not as complete or necessary as it seemed.

I suppose the proposed state of affairs (universal interdependence) is formally conceivable, although I do not see on what grounds we could possibly allow such rejection in one fell swoop of a large number of moduses (i.e. all alternative moduses concerning the strong determinations). Unless a reasonable formal or empirical ground is provided, there is no justification in such a radical measure: it would constitute prejudice. The Buddhist claim is of course based on a meditative experience; but since this is esoteric, not readily available to all observers at will, we must remain critical and view it as speculative. We cannot categorically eliminate it on firm rational grounds, but we cannot just take it on faith.

It should be realized that causation is a conceptual object, not a percept. Before we can discern a causative relation between two or more percepts (and all the more so between concepts) we have

to distinguish the percepts from each other (and conceptualize them by comparison and contrast of many percepts, in the case of concepts). Also, causation refers to negation, which is a product of rational as well as empirical factors. Thus, if we approach the issue of causation with respect to the phenomenological order of things, we must recognize that it is a rather high-level *abstract*, although of basic importance in the organization of knowledge. It is not something we just directly see or otherwise sense. For this reason, we may remain skeptical that there is some flash of insight that would instantly reveal the causal relations of all things in the universe.

Thus, while the interdependence doctrine apparently does not give rise to formal inconsistency, we have good reason to doubt it with reference to normal human knowledge development. Causation is ordinarily known only gradually, through painstaking observation and analysis of particular data, always subject to review and revision as new data makes its appearance and possible contradictions are encountered. Our minds are not omniscient or rigidly deductive, but cumulative and flexibly inductive: we proceed by trial and error, constantly adjusting our positions to match up with new input and logical insight. Therefore, we cannot rely on sweeping statements, like that about interdependence, without being very careful.

Of course, some philosophers would argue back that causation as such is a man-made illusion, since pure experience only reveals *undifferentiated presence*. Differentiation into 'distinct' percepts, and finding that some sought things are 'absent', and conceptualization on the basis of 'similarities and differences', are all acts of reason. Indeed, if all perceived appearances are regarded as mere wave motions in a single, otherwise uniform substrate of existence (the 'original ground' of Buddhists or the Unified Field of physicists), then the boundaries we think we perceive or conceive for individuated things are in fact mere fictions, and all things (including even our fantasies about causation) are ultimately One in a very real sense.

So, let us keep an open mind either way, and cheerfully move on. I just want to add one more small set of reflections, which the Buddhist idea of interdependence generated in me. This idea

is often justified with reference to causal chains[125]. I tried therefore to imagine the world as a large body of water, like Lake Geneva say. According to this theory, supposedly, a disturbance anywhere in the lake eventually ripples through *the whole* lake, to an ever-diminishing degree but never dampening to zero. I then translated this image into the language of causal chains, for purposes of formal evaluation.

Looking at the results of macroanalysis, one would immediately answer that the Buddhist expectation is wrong. As we have seen, ***a cause of a cause of something is not necessarily itself a cause of that thing; and even if it is a cause, it may be so to a lesser degree***. Many first figure syllogisms yield no causative conclusion, although their premises are compatible. Some do yield a conclusion, but that conclusion is often weaker in determination than the premises. Thus, we have formal reasons to doubt the idea of interdependence, if it is taken to imply that 'a cause of cause of something is itself in turn a cause of that thing'.

All the same, I thought, thinking of the movement of disturbances in the lake, there is some truth in the contention. I then thought that maybe we should conceive of '*orders of causation*' – and postulate that even "if A causes B and B causes C, but nevertheless A does not syllogistically cause C" is true in a given case in terms of first-order causation, it can still be said that A causes C in second-order causation. And we could perhaps continue, and declare that if the latter (meaning, causes a cause of) is not applicable in a given case, we could appeal to a third order of causation, etc. We might thus, in an attempt to give credence to all theories, explain the Buddhist notion as involving a diluted sense of 'causation'.

This idea seemed plausible for a while, until I got into microanalysis. In the latter approach, conclusions are given in terms of alternative moduses. There is no room for a fanciful, more abstract, additional order of causation: the result would be identical, still the same number (one or more) of legitimate

125 See for instance Thich Naht Hanh, *The Heart of Understanding* (Berkeley, Ca.: Parallax, 1988).

alternative moduses. No useful purpose would be served in inventing new (narrower or broader) sets of alternative moduses, and giving such groups new names. We could only at best regard all moduses in a grand matrix (other than the first, composed of all zeros) as indicative of some 'causation' (in a maximal sense), and so say that any alternative modus found at the conclusion of a syllogistic intersection is '*residual causation*'.

But having reached this bottom line, we see how trite the suggestion is.

3. Other Features of Causation

Before closing the present chapter, I would like to add some brief comments on some features of causation that should be further highlighted.

a) **Parallel Causation**. This concept was presented in some detail in our initial discussion of the generic and specific determinations, and thereafter no longer mentioned. I here just wish to remind the reader of the possibility that different causes, which are not necessarily causatively related to each other, may nevertheless have a causative relation to the same effect. That is, two things, say A and B may separately (strongly or weakly) cause some third thing C, and yet A does not cause B and B does not cause A. As the proverb says, many roads lead to Rome. If this is forgotten, one may easily get confused and think of 'pluralities of causes' as only possible within a single weak causation or in a chain of (weak or strong) causations.

This feature of causation is implicit in the microanalytic approach, insofar the possibility of *several grand matrices having common items* is not formally excluded.

b) **Degrees of Causation**. We have developed the concept of weak causation without distinction between the different possible degrees of such weak causation. That is, we have to also ask: what is more effective, what plays a larger part in producing the effect, the item (or collection of items) called partial and/or

contingent cause or the item (or collection of items) called the 'complement'? We did set up a gross hierarchy between the joint determinations, **mn** being the strongest, **mq** and **np** being middling, and **pq** being the weakest. But we also mentioned that in weak causation, the participant items may have unequal shares in the causation.

This feature of causation has not been made apparent in matricial analysis so far, and therefore needs to be accounted for in some way. I would suggest offhand that the way to include it may be to consider *the degrees of probability underlying each possibility* mentioned in the alternative moduses concerned. Thus, instead of a code '1' in each cell of an alternative modus, we might have some as worth 20%, others 40%, etc., with all non-zeros adding up to 100% probability. For example, if P and Q are complementary partial causes of R, P without Q may be more likely to be followed by R than Q without P.

In some cases, the issue may be dealt with by considering concomitant variations (see below). In any case, this topic requires further attention.

c) **Reciprocity and Direction**.

A cause and effect may (in some cases, not all) be interchangeable. For example, if we refer to the 'ideal gas equation' PV/T = constant, and consider a gas at constant temperature, we know that if the pressure is varied (increased or decreased), then the volume varies accordingly (decreased or increased). It is also true that if the volume is varied, the pressure is proportionately affected. This is *mutual causation*. Some things in a cause-effect relation do not have similar reciprocity. For example, no matter what we do, entropy further increases: our relation to entropy is one-way.

It should be stressed that even if we acknowledge that the *direction of causation* may only go in the direction of time, cause and effect are often simultaneous events (this is especially common in the extensional mode of causation, but also occurs in the natural mode). Cases of mutual causation, as well as cases of non-reciprocity, may occur either way, i.e. with cause temporally before effect or with both at the same time.

The essence of causation is certain possibilities and impossibilities of conjunctions – it does not concern questions of reciprocity or direction. These issues are left implicit in matricial analysis, acknowledged as formally possible by virtue of being ignored.

d) **Concomitant Variation**. We analyzed J. S. Mill's fifth method, that of Concomitant Variations[126], in some detail in Appendix 1. Although I mentioned this there, I want to here stress that this method concerns not only strong causation, but also weak causation. The above-mentioned 'ideal gas equation' is an excellent example[127]. In strong causation, the concomitant variation between cause and effect is one-to-one, although not necessarily proportional. In cases of weak causation, where two or more causes together produce the effect, the part played by each factor is clarified by (if possible) holding any other factor in check (i.e. constant) while varying the one examined. This is of course not always possible.

When it is possible, the standard technique is to tabulate or graphically represent the results of experiment and then try and express them in a mathematical formula, like PV/T = constant, which summarizes a mass of if-then statements as already explained. Epistemologically, this constitutes generalization from observation. When such simple approach is not possible, because we cannot directly control the situation (for instance, in some sociological or medical researches), we resort to adductive methodology. We posit certain postulates, construct a formula out of them, and then test that formula with reference to empirical data.

It should be seen that concomitant variation deals essentially in concepts, rather than percepts. A percept is only what it is: if change occurs, another percept has replaced it. A concept, on the other hand, is an abstraction, which may well have different

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126 Given in his *A System of Logic*. This can be found online at: https://www.gutenberg.org/files/27942/27942-h/27942-h.html.

127 I always feel a certain affection for that example, which I learned in my teens. It shows how education has an impact on us.

particular values in different cases or situations. Our formulae are algebra, not arithmetic.

We shall have to analyze concomitant variation further with reference to matricial analysis. Can the latter method be enlarged or clarified to include consideration of the former within it?

27. KNOWLEDGE OF VOLITION, ETC.

Drawn from Volition and Allied Causal Concepts (2004), Chapters 3:1 and 5:2.

1. Knowledge of Volition

There is little mystery left as to how to theoretically define causation and how we get to establish it in practice. A mixture of epistemological and ontological issues is involved, which are resolved with relative ease. Causation in general may be expressed in terms of conditional propositions, or more profoundly with reference to matricial analysis. And particular causative relations can be established inductively, by observation of conjunctions and separations of events and their negations, and appropriate generalizations and particularizations.

Not so easy for volition. Many philosophers and psychologists are discouraged by the difficulties surrounding the concept of volition (or will). How is it known? How can it be defined in general? How are particular acts of will apprehended? How can we prove they belong to the agent, are his responsibility? How to conceive freedom of the will, let alone prove it? And so forth. But a thinker should not despair too early. We can gradually build up our reflection on the subject, and hope to clarify issues.

As earlier suggested, volition – unlike causation – cannot entirely be defined by means of hypothetical (if–then) propositions. However, we can *partially* delimit volition that way, as follows.

First, we focus on volition as the presumed 'causal' relation between an agent (soul) and certain events in or around him (called events of will), whatever be the exact form of that relation. That relation may intuitively be assumed to be *other than* causation, though some causation may be involved in it. A general causative statement "without an agent, there would be

no volition" can be invoked to show partial involvement of causation.

Second, we point out that without that *particular* agent, those particular events would not – indeed could not – occur; they are reserved for that soul, it is irreplaceable in their genesis. This may be expressed as a conditional proposition: "**if not this particular soul, then not those particular events**," The latter just means that the agent concerned (as an individual, and not just as an instance of a kind) is a *sine qua non* of the particular events (presumed 'of will') under scrutiny.

However, while the soul is thus a necessary causative of the events, it does not causatively necessitate them, i.e. it is not a *complete* causative of them. For it is clear that, in what we call volition, the soul is not invariably followed by those events (the presumed events of will), but remains at all times – till they do occur – also compatible with their negations. That is to say, with regard to causation, the compound conditional proposition "**if this soul, not-then these events and not-then their negations**" is true[128].

However – and therein lies the mystery of volition – we intuit that the agent *alone* does somehow 'make necessary' or 'completely cause' the events concerned *when they do occur*. At that time, the proposition "if this soul, then these events" becomes effectively true, although such a change of 'natural law' is not possible under the relation called causation. Therefore, some other category of causality must be involved in such cases, which we call volition.

That is about as far as we can get into a definition by means of ordinary conditional propositions. We can delimit the concept of volition to a large extent, and clearly distinguish it from causation, but that is still not enough to fully specify its formal structure. We can, however, go further by other means, step by step, as we shall see by and by.

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128 The "if–not-then" form of hypothetical, I remind the reader, is the exact contradictory of the "if–then" form. It simply means that the consequent "*does not follow*" the antecedent.

Certain epistemological questions can be answered readily. To begin with, as I have argued in *Phenomenology*, the raw data for the concept of volition has to be personal 'intuitions' – in the sense of direct experience, self-knowledge – of one's own particular acts of will.

Will has no phenomenal qualities: it should not be confused with its phenomenal products in the mental or material domains; volition cannot therefore be an abstraction from material or mental experiences. We evidently know introspectively – at least in some cases, when we make the effort of honest introspection – when we have willed, and what we have willed, and even the effort involved, i.e. to what degree we have willed. Such *particular* intuitions of will in the present tense give rise to the abstraction of will, i.e. the concept of volition.

Thus, the conception of volition is an ordinary inductive process, except that its experienced instances are not phenomenal percepts but intuitions. This of course does not tell us the definition of volition as a causal relation. But it does tell us that there is something to discuss and define, as in the above initial attempt.

But of course, we do not only assign volition to ourselves, but we assume it in other people (some of us assume it further in other animals[129], and also in God). Here, the thought involved is more intricate. A person knows from his own experience which

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129 As I write, it is mid-February, and almost every day, as I drink my morning coffee, I watch a pair of magpies not ten meters away, enacting a ritual. Each in turn tears a twig off the tree they are perched on, and places it precariously on the same branch for a moment, letting it eventually fall. They are, evidently, not yet trying to build a nest; rather, they seem to be making common plans, coming to an agreement as to where they intend to do it when the time is ripe. I even once saw them rehearsing feeding, with one bird pretending to put a small nut into the other's beak. They, supposedly the same birds, actually started building their nest in late March. What I thought was rehearsal of feeding may have been that of cementing, because I saw that they bring each other what seems to be mud pellets that are stuffed between twigs. Anyone observing animals cannot but suppose they are able to imagine goals and to pursue them, as well as communicate (at least by such physical demonstrations) and cooperate (effectively sharing duties).

externally visible actions of his are due to will (and which are not) – for example, moving one's arm (as distinct from having it moved by someone or something). Having recorded the descriptions and conditions of willed (and unwilled) externally visible actions, we can by generalization assume that, when we see the same external behavior in others, we can infer a similar internal behavior in them.

In other words, whereas with regard to ourselves, we know the cause first and thereafter observe its effects, with regard to other agents, we infer the cause from the observed effect, by analogy.

Of course, none of this implies omniscience, either of our own acts, and much less of others' acts. Sometimes, we have difficulties discerning our will – for instance, what we really wanted, or whether we acted voluntarily or involuntarily. Introspection is not always successful, especially if one has the habit of keeping one's inner life murky and inaccessible to scrutiny. Sometimes, even if one is sincere and transparent, contradictory subliminal forces are at play, causing confusion in us. All the more so, with respect to other people: we may not have all the evidence at hand allowing us to draw a conclusion. What we observe of their behavior may be only a partial picture, leaving us uncertain as to their intentions. And so forth; no need to go into detail at this stage.

Thus, it should be understood that in this field of knowledge, as in all others, our conclusions are ultimately inductive rather than deductive. We have a certain database – consisting of our own self-observations and all other information – and we use it, and our powers of imagination, to formulate and test hypotheses. The logic involved is similar to that in the natural sciences. The only difference is the nature and source of some of the data used: it is non-phenomenal and personally intuited. This is of course a significant ontological and epistemological difference, but once realized the issues are much simplified.

2. Knowledge of Effort, Influence and Freedom

Effort and influence are, clearly, derivative concepts of cognition and volition. The empirical basis of our knowledge of them is therefore the same as for cognition and volition, primarily introspection or subjective apprehension. This direct self-knowledge, which I call intuition (or apperception), concerns objects that do not *per se* have inner or outer phenomenal qualities – i.e. no shape, shading or color, no sound, no smell or taste, no touch qualities – although they may produce perceptible objects.

Just as we intuit our own will, so we intuit the amount of effort we have put into it. Colloquially, we say that effort is 'felt'. 'Physical effort' is experienced as a sensation in the body; but 'mental effort', or more precisely 'spiritual effort', is a subtler experience, which may or not give rise to discernable phenomena. Measurement of effort is therefore, of course, not exact and absolute, but rough and comparative. It depends not only on the immediate intuition, but also on personal memory of past intuitions for purposes of calibration.

If estimate of effort is inexact with regard to oneself, it is all the more so with reference to the effort of others. We can only guess it, by analogy to one's own experience and by observation of indirect indices, like (in the case of physical effects of it) the sweat on someone's brow or his facial expressions or bodily postures. Thus, as for will, knowledge of effort is generally based on adductive arguments.

It is not inconceivable that one day soon biologists succeed in measuring effort more objectively and scientifically, by means of physical instruments. Quantification of effort would then become more precise and verifiable. Such practices will of course involve adductive reasoning, an initial hypothesis that such and such detectable physiological or neurological phenomena may be interpreted as proportional to the effort of will. But in the meantime, we do have a rough yardstick in our personal experience.

Influence is a more abstract concept, not experienced or measurable directly, but constructed with reference to amounts of effort involved in willful action (making it easier or harder). An object is said to influence one's action if *its appearance* to oneself directly or indirectly affects or conditions the action, in contradistinction to an object affecting or conditioning action by *mere existence*. Note well the phenomenological differentia.

If the influence occurs only by perception of the object, it is simple, direct. If it occurs after considerable mental processing of the image of the object, it is proportionately complex, oblique. Since thought about an object perceived may have many pathways, of varying intricacy, the influence by one and the same object may be multiple, involving many theses and layers, some of which may well be conflicting. Even at the perceptual level, the various sense organs yield different aspects of the (presumably same) object. Thus, *one and the same object may give rise to many, variant influences*. We must keep this insight in mind, to avoid oversimplification in our understanding of influence and volition.

Another epistemological issue concerns our estimates of *the relative weights* of different simultaneous influences. Such estimates are based in part on generalization of personal observations (when data on conjunction and separation is available); but in large part, they are hypotheses, adhered to so long as they continue to be confirmed by our experiences of effort. Knowledge of one's own psyche is very often as tentative as that of nature, or of other people's or animals' psyches. People often think that they have 'direct insight' into, or at least 'deductive knowledge' of, inner events or relations, when in fact all they have is inductive knowledge. What is important is to realize that the latter is pretty good, quite enough.

Knowledge of freedom of the will is partly introspective, but mainly adductive. Our inner sense of freedom of will provides the occasion for the theoretical search for supporting data and postulates. We may have faith in freewill as a working hypothesis, but are still called upon to develop over the long term convincing definitions of it and arguments in its favor. The formula above proposed for freedom of the will is, I think, a good start.

The doctrine of freewill is important psychologically and socially, the foundation of morality and law. The doctrine declares our responsibility for our actions, however many and strong the forces impinging upon us may seem. Thus, a criminal cannot disclaim responsibility for his crimes, arguing he was ‘driven’ against his will.

We should note the doctrine’s own influence on human action, by the power of suggestion: if one believes he *can* do or avoid something he is more likely to be able to do so, than if he thinks that he cannot do so no matter how much he tries. Thus, belief in freedom of the will increases one’s ‘freedom’, and disbelief in it is an added obstacle.

28. THOUGHTS ON INDUCTION

Drawn from Ruminations (2005), Chapter 2:1-15,17-18.

1. Evidence

The Obvious

Every experience (concrete appearance – physical or mental percept, or intuition) is 'evident', in the sense that it is manifest before consciousness and that such appearance automatically gives it a minimum of credibility.

Concepts or theses (products of abstraction) are not themselves evident in this sense (though they too 'appear' in a sense), but rely for their credibility on their relation to certain experiences. An experience is 'evidence for' some concept or thesis, when it serves to confirm it adductively. A concept or thesis is 'evidently true' to the degree that such evidence for it is to be found.

A concept or thesis is said to be 'immediately evident', when very little effort is required to establish its truth, i.e. when the evidence that suffices to do so is readily available to everyone.

A concept or thesis is 'self-evident' (or evident by itself), if it is provable without reference to further experiential evidence (other than the minimum experience underlying its very conception or formulation). Such proof is achieved by noticing or showing the negation of the concept or thesis to involve an inconsistency or a self-contradiction of some sort.

We label 'obvious', then, all experiences (as such, i.e. in and for themselves), as well as 'immediately evident' and 'self-evident' concepts or theses.

Seems and Is

The following are some of the **inductive arguments** which help clarify *the logical relations between the copulae 'seems' and 'is'*:

Uncertain mood:
P seems true and NotP seems equally true;
therefore (for this observer, at this time):
P ‘may be’ true, and equally NotP ‘may be’ true.

Probabilistic mood:
P seems true more than NotP seems true;
therefore (for this observer, at this time):
P ‘is probably’ true, and NotP ‘is probably not’ true.

Decisive mood:
P seems true and NotP does not seem true;
therefore (for this observer, at this time):
P ‘is’ true, and NotP ‘is not’ true.

Adductive Inference

Adductive inference often takes the form of a deductively invalid syllogism, such as:

All Z are Y, and
these X are Y;
therefore, these X are probably Z.

Of course, strictly speaking the conclusion does not follow from the premises; however, the premises do *suggest some likelihood* for the conclusion.

For example, “all beans in your bag are white, and the beans in your hand are white; therefore, the beans in your hand are probably from your bag.”

Trial and Error

With regard to the trial and error involved in adduction: “trial” means trying an idea out in practice, testing a theory by observation; and “error” means that some of the ideas we test

will fail the test and thus be eliminated from further consideration or at least adjusted.

This is a rather broad notion. There are perhaps numerous, distinguishable types of 'trial and error' – in different fields of study, in different situations – which we ought to distinguish and list. I do not attempt it here.

It should in any case be stressed that this simple method is pervasive in our pursuit of knowledge. Already at the level of sensation, we are using it all the time. For instance, when we smell food to check out if it is fresh, we are using this method. At the level of concept formation, we again repeatedly appeal to it. E.g. when we try out different definitions for a group of things that seem similar, we are using this method. Similarly, when we formulate individual propositions or compounds of many propositions, we use trial and error.

Trial and error is not just a 'scientific method' for high level theoreticians and experimenters – it is the basic way to knowledge by mankind, and indeed by all sentient beings. It is 'adaptation' to the environment in the domain of knowledge, a subset of biological adaptation applicable to conscious organisms.

Approaching Reality

What do we mean by a thesis "*approaching reality*"? We refer to the *disjunction* of all conceivable (now or ever, i.e. to date or in the future) solutions to a problem. At every *elimination* of one of these alternative solutions, all other alternatives are brought closer to being "the" solution. It is a bit like a game of musical chairs, where the last, leftover contestant will be declared the winner. As the list of possibilities is shortened, the status of each possible solution is increased. Thus, it is not only through confirmation (of a given thesis), but also through rejection (of alternative theses), that the given thesis advances in our esteem, or in its "degree of truth," In this way, we do not have to claim every thesis true or false without making nuances, and can view the quantitative aspect of induction as having formal justification.

Appearance, Reality and Illusion

Phenomenology results from a realization that the building blocks of knowledge are appearances. This realization is obtained through a dialectic, comprising thesis, antithesis and synthesis, as follows.

At first, one naturally regards everything one comes across in experience or thought as ‘**real**’ (this is the ‘naïve realist’ stance).

Then, faced with evident contradictions and gaps in one’s knowledge, one logically realizes that some things that seemed real at first must or at least may eventually be considered unreal – i.e. ‘**illusory**’ (this constitutes a cognitive crisis).

Finally, one realizes that, whether something is real or illusory (and ultimately remains so or turns out to be the opposite), at least it can immediately (unconditionally and absolutely) be acknowledged as ‘**apparent**’ (this is the ‘phenomenological’ stance, which resolves the crisis).

Knowledge of reality can then be inductively built up from knowledge of appearances, thanks to the following principle (d): ***One may credibly assume something that appears to be real is indeed real, until and unless it is proved illusory or at least put in doubt for some specific reason.*** This may be characterized ‘subtle realism’, and proceeds from the realization that the mere fact of appearance is the source of all credibility.

Thus, phenomenology follows the natural flow of knowledge, which is to initially accept individual appearances as real, while remaining ready to reclassify them as illusory if they give rise to specific logical problems that can only be solved in that specific way. The concept of ‘appearance’ is therefore not strictly primary, but a transitional term for use in problematic cases. Since it refers to the common ground between ‘reality’ and ‘illusion’, it is deductively primary. But since the latter are in practice attained before it, it is inductively secondary.

The concepts appearance, reality and illusion are to begin with concerned with experiences; and only thereafter, by analogy, they are applied to abstractions, i.e. conceptual products of experience arrived at through rational considerations, such as comparison and contrast (i.e. affirmation or negation, and measurement).

The term 'fact' is usually intended to refer to purely experiential data, i.e. the raw material of knowledge, in which case the opposite term 'fiction' refers to other items of knowledge, i.e. those tainted by interpretative hypotheses. (But note that in practice of course we do not always abide by such strict definitions, and may use the terms more broadly or narrowly.)

The concepts of truth, falsehood and uncertainty correspond in scope to those of reality, illusion and appearance. The latter triad is applied to the contents of propositions, while the former concerns the propositions as such. For example, considering "dogs bark," the fact of dogs barking is 'a reality', while the proposition that dogs bark is 'true'; similarly in other cases.

Once we understand all such concepts as signifying different epistemological and ontological *statuses*, it becomes clear why they need to be distinguished from each other. They are all used as logical instruments – to clarify and order discourse, and avoid confusions and antinomies.

Note well that phenomenology is not a skeptical philosophy that denies reality to all appearances and claims them all to be illusions. Such a posture (which too many philosophers have stupidly fallen into) is logically self-contradictory, since it claims itself true while rejecting all possibility of truth. The concept of illusion has no meaning if that of reality is denied; some credulity is needed for incredulity. Doubt is always based on some apparent contradiction or gap in knowledge; i.e. it is itself also an item within knowledge.

Existence and Non-existence

What is the relation between the concepts of existence and non-existence (or being and non-being), and those just elucidated of appearance, reality and illusion, one might ask?

At first, the term existence may be compared to that of reality, or more broadly to that of appearance (to admit the fact that illusions occur, even if their status is not equal to that of realities). However, upon reflection, an important divergence occurs when factors like time and place are taken into consideration.

We need to be able to verbally express changes in experience over time, space and other circumstances. An appearance, be it

real or illusory, 'exists' at the time and place of its appearance – but may 'not exist' at some earlier or later time, or in another place. The 'existence' of appearances is transient, local, conditional and relative.

What appears today may cease to appear tomorrow, although it might (or might not) continue to appear less manifestly, through someone's memory of it or through the appearance of exclusive effects of it. Something may appear here within my field of vision, but be absent elsewhere. You may see this in some circumstances, and then notice its absence in others.

We thus need to distinguish different ways of appearance. With reference to time: in actuality, or through memory or anticipation; or with reference to spatial positioning. Or again, with regard to modality: in actuality, only through potentiality (i.e. in some circumstances other than those currently operative), or through necessity (i.e. in all circumstances).

Time and place also incite a distinction between 'existence' and 'reality' (or 'truth'), in that when something ceases to exist at a given time and place, the reality of its having existed at the previous time and place is not affected.

Furthermore, appearances are apparent to someone, somewhere – they are contents of consciousness, objects of cognition. The concept of existence is differentiated also with reference to this, by conceiving that what may be apparent to one Subject, may not be so to another. Moreover, we wish to eventually acknowledge that something may conceivably exist even without being experienced by anyone (though of course, in defining such a category, we must admit for consistency's sake that we are thereby at least vaguely and indirectly conceptually cognizing the object concerned).

We thus come to the realization that *the concept of appearance is a relatively subjective one, involving two distinct factors: an object of some kind with specific manifestations, on the one hand, and an awareness by someone of that object at a given time and place*. The concept of existence is intended to separate out the objective factor from the factor of consciousness implicit in the concept of appearance.

'Existence' is thus needed to objectify 'appearance', and allow us to conceive of the object apart from any subject's consciousness of it. We need to be able to conceive of the objects appearing to us as sometimes 'continuing on' even when we cease to be aware of them. Furthermore, we need to be able to consider objects that we have not yet personally experienced, and even may never experience. In this manner, we can project our minds beyond mere appearance, and through conception and adduction hope to grasp existence in a larger sense.

The concept of existence and its negation are thus additional instruments of logic, facilitating rational discourse, without which we would not be able to mentally express many distinctions. Consequently, saying 'existence exists' and 'non-existence does not exist' is not mere tautology, but an acknowledgement that the words we use have certain useful intentions. These statements constitute one more way for us to express the laws of thought. Existence cannot be denied, and non-existence cannot be affirmed.

We do not make the distinction between 'existents' and non-existents' by mentally lining up two kinds of things, like apples and things other than apples. The epistemological scenario applicable to most of our concepts is not applicable to such basic ones, which are of a more broadly pragmatic nature. Discernment rather than distinction is involved.

Whereas the concept 'existence' has some ultimate experiential content, 'non-existence' has none – because factual denial is not based on the same mental process as affirmation. We never experience non-existence – we only (in certain cases) *fail to* experience existence. The concept of existence is not built up by contrast to that of non-existence, since (by definition) the former relates to 'all things' and the latter to 'nothing', and nothing is not some kind of something. There is no time, place or circumstance containing nothingness. The word 'non-existence' is just a dumping place for all the words and sentences that have been identified as meaningless or false.

Terms like 'existence' and 'non-existence' are not ordinary subjects, copulae or predicates; they are too broad and basic to be treated like any other terms. Those who construct a theory of

knowledge, or an ontology, which concludes that 'existence does not exist' or that 'non-existence exists' have not understood the logic of adduction. When there is a conflict between theory and observed facts, it is the theory (or the 'reasoning' that led up to it) that is put in doubt and is to be dismissed, not the facts.

2. Theorizing

Critical Thought

Critical thought, or criticism, is considering the truth or falsehood of an idea – not only its truth, and not only its falsehood, either. It is not essentially a negative, anymore than positive, penchant, but an attitude of rigorous review in judgment, of keeping our standards high.

What makes a theory "scientific," in the strict sense, is not whether it emanates from some prestigious personage or institution or corporation, but whether a maximum of care has been taken to formulate it and test it in accord with all known criteria of inductive and deductive logic. Science does not primarily mean, as some imagine, lab technicians with white aprons or university professors, or the exact sciences or mathematical equations. The term "science" initially refers to serious study, or to pursuit of knowledge as against mere opinion. It signifies a sustained effort of sound methodology, as currently possible and appropriate to the field of study concerned.

Degree of Detail

An important criterion for the credibility of theories is the *degree of detail* they propose. For instance, the immediate Creation theory is vague, whereas the gradual Evolution theory offers detailed descriptions of entities and processes. But of course, even the most detailed theory may turn out to be false. The existence of elaborate fictions in the form of novels (or scientific hoaxes presented as fact) shows that detail is not by itself proof.

One should also distinguish between **explaining** (e.g. fossils are leftovers of creatures that lived on earth in times past) and **explaining-away** (e.g. fossils are mere artifacts placed on earth

by God to test people's faith). The former is generally preferable to the latter. Though here again, the criterion is not determining.

"Somehow"

Theorizing is of course not a one-time, static thing, but an ongoing, changing process.

An old theory may be replaced a new one, either because *the facts* currently faced are not covered by the old theory or because some *logical or conceptual* imperfection or inadequacy has been found in it. The new theory may not be much different from the old, a mere adjustment of it, but it must in any case bring something extra to bear, either a wider capacity to explain facts or some sort of logical improvement or conceptual clarification.

In setting standards for theorizing, we must highlight ***the fallacy of relying on "somehows"*** as a way to leap over *holes* in one's theories. This may be viewed as one of the ways people "jump to conclusions,"

For example, to defend the idea of theodicy (Divine justice or karma), we posit a thesis of reincarnation (in this world or another). That is, seeing the injustice evident in everyday life, we first think there must be some hidden guilt in the life of the victim, and that unpunished criminals will be dealt with before their life is through. We assume that, in the long run, over the course of a whole life, apparent discrepancies are canceled out and equilibrium is restored. But then, realizing that this too is evidently not empirically true we assume reincarnation as an explanation. For instance, children are sometimes raped or murdered; and since these are clearly innocent victims within their current life, granting that children are not punished for their parent's sins, the assumption of justice makes us suppose that they committed commensurate crime in a past life. Similarly, for an evidently unpunished criminal, it is assumed that Divine justice will punish him in an afterworld, or that karma will do so in a future life.[130]

130 As I have pointed out elsewhere, such doctrines are unfair to innocent victims, accusing them without justification of past crimes; and

In cases like this, the big fallacy is to be satisfied with a "somehow" to fill the gaps in our hypothesis. In the case of reincarnation, for instance, the theory should not be accepted unless *an exact description of events* in the transition from body to body were proposed, combined with *a set of testable predictions* that would make possible at least some empirical confirmation of the thesis (besides the events it is designed to explain). The *apparent* support that a *vague* reincarnation thesis gives to the *foregone* conclusion that "there is always justice" is not sufficient.

There are almost always hidden obscurities in our theories: the vagueness of some term, the lack of clarity of some proposition, the jumping to conclusions in some argument. Indeed, the sciences cannot claim success in their enterprise, as long as philosophy does not claim its own success. So long as consciousness, knowledge, universals, and similar concepts and problems of philosophy are not fully understood and solved, anything the special sciences say ignores such underlying obscurities and uncertainties. This means that the apparent success of science is temporary and delimited. Success can only be claimed at infinity, when all branches of knowledge reach their respective goals.

Pertinence

Pertinence might be explicated as the construction of an appropriate major premise, so that a given minor premise is enabled to yield the proposed conclusion. (I am thinking here of my findings in a-fortiori logic, generalizing the way we comprehend certain Biblical statements as inferences by interposing a presumed tacit major premise.[131])

How is the missing major premise discovered? It is not found by some direct, infallible insight – but as in all our knowledge (although we may not be consciously aware of these mental processes), it is arrived at inductively, by means of trial and error.

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they whitewash criminals, making it seem like they merely implement justice!

131 See *Judaic Logic*, chapter 4.2.

There may in fact be several alternative major premises, equally able to fulfill the required task of making the inference possible – equally pertinent. We may be aware of only some of these available possibilities.

We start by proposing a likely candidate for the post of major premise. This may at first glance seem like the most likely hypothesis. Later, we may change our minds, considering that the candidate does not fit in our overall context of knowledge in some respect(s). For instance, the proposed major premise might be more general than necessary, so that although it allows us to draw the desired conclusion in the present narrow context, it causes some havoc in a wider perspective. In such case, we propose a less general major premise or a considerably different one; and so on, till we are satisfied.

A hypothesis proposed is 'pertinent', if it can do the job at hand, which is to infer the desired conclusion from the given (minor) premise, even if it turns out to be rejected because it does not fit into the broader context. A proposed major premise incapable of fulfilling this role is 'impertinent'.

Field Specific

Each field of study has methods and parameters **peculiar** to it, as well as many that are found in common with other fields. We may thus refer to specialized principles of logic.

For example, the logic of historical research (historiology) would demand that the various forms of evidence – physical remnants (artifacts, drawings, writings, etc.), behavioral indices (traditions handed down), as well as verbal sources (witnesses, second-hand contemporary testimony, historians' later claims, etc.) – be clearly categorized and distinguished from each other, and their relative weight as evidence be assessed as objectively as possible.

Misappropriation

The most common logical fallacy is perhaps **the misappropriation of logical expressions** – using the language of logic, without having in fact resorted to logical processes. This often suffices to convince some people.

For examples: one might say: "it is a reasonable assumption that…" when one has made no attempt to logically check the issue out; or: "it may be inferred that…" when no deductive or even inductive logical process allows such inference. One gives the impression of logic, but without factual basis. Words like "it must be that," "a fortiori," "in conclusion," "because of," etc., are freely used as alibis, in lieu of logic, in the way of mimicry, when logic was in fact ignored or opposed.

Of course, such behavior in discourse is not always intentional dishonesty. It is often due to ignorance of logic or lack of logical skill, or even just to inattentive, vague and imprecise thinking. In particular, many people are not aware of *the difference between strictly deductive inference and merely inductive inference* – these two logical modes being all the same to them. Sometimes, even though their reasoning was sound and its results plausible, they are just not aware exactly how they did it.

An example of intentional dishonesty is the discourse of Nagarjuna, which as I show in *Buddhist Illogic* is replete with pretended logic.

Another notable example of pseudo-logical discourse is Sigmund Freud's "*Moses and Monotheism*," His method there can be characterized as *false advertising* and *creeping annexation*. He says he won't engage in some form of argument (which would be too obviously logically illicit or unscientific); and then, in the very next breath or gradually thereafter, he goes ahead and inserts that very argument into his discourse (to justify his prejudices). He loudly acknowledges the argument to be invalid (so as to give the impression that his approach is virtuously objective and scientific); then, coolly ignoring the very methodological imperatives he has just admitted, he hammers home his (foregone) 'conclusions'. It is psychological manipulation. He relies on the prestige acquired in his field to pass over lies concerning another field.[132]

132 It is my wish to analyze that whole book in detail someday, so as to show up the cunning and variety of his tricks.

3. Additional Remarks

Experiment

Experiment is a category of observation. It is observation in the midst of active interventions, in contrast to totally passive observation. Even when an observer moves around an object to see it from other angles, without interfering with the object, that is experiment of sorts. Asking people questions on some topic is also experiment of sorts.

Of course, when we think of experiment, we especially think of manipulations of some object – i.e. changing some conditions in or around it, and observing how its properties or behaviors are affected. Scientific experiment may be viewed as a way to speed up observation – making the object go through different phases of its nature, rather than waiting for it to vary by happenstance. Experiment improves on mere observation simply because it expands its scope. Experiment is not some new discovery by modern science[133] but has always existed – since the first man prodded some beast with his finger to see how it would react!

To conclude, the distinction of experimentation is not manipulation of the object, but action by the observer. The essence of experimental research is still observation. It is active, instead of passive, observation. Experiment is not some epistemological category apart from and superior to observation.

Indeed, one might well ask if any observation is passive. But the answer to that is necessarily yes. At the end of any experimental activity, there has to be a moment of passive observation. Rather, then, one might say that the essence of observation is passive – patient looking and seeing, receptivity and attention.

Experiment can of course go wrong for a variety of reasons; its results are not always credible. It may be designed on the basis of wrong theoretical or practical assumptions; the physical equipment intended to control or measure the phenomena studied may be badly constructed or set up; the researchers may

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133 Although, of course, modern science has been using experiment more consciously, systematically and successfully than ever before.

be insufficiently careful and accurate in their handlings and readings, whether inadvertently or ‘accidentally / on purpose’; the researchers may erroneously record their correct findings; and the results may be misinterpreted, due to weak logic or lack of intelligence or narrow knowledge base, or simply due to conscious or unconscious bias.

Often, experimenters are simply unable to see things differently from the schemas they are used to, and have foregone conclusions in their minds no matter what the experiments they make imply. Sometimes, however, experimental results seem contrary to all expectation and the incredulity of researchers is eventually legitimated by review of all procedures and further experiment. If an experiment gives *inexplicable results* in the light of all current knowledge and theory, one should indeed review and redo it very carefully.

Thus, theory and experiment have a dynamic, two-way relation. Experiments are meant to confirm or refute theories, by testing their predictions. But also, theories are used to design and evaluate experiments, as well as to explain their results. The two must repeatedly be adapted to each other.

The Human Factor

Induction depends greatly on the human factor – on our intelligence (in some cases, genius), on our open-mindedness, on the clarity and rigor of our thinking, and on the detachment and carefulness of our reasoning and experimentation.

When theorizing and setting up tests to confirm or reject our theories, it is important to make a big effort to foresee all conceivable explanations and all their possible implications. If the theories considered are not all the theories conceivable in the present context, or if we do not correctly work out their respective experimental predictions, our inductive conclusions are bound to be faulty and misleading.

The danger could be illustrated with the following example from the history of science[134]. At one time, people thought that tiny living organisms could be ‘spontaneously generated’ – e.g. maggots could appear out of nowhere in rotting meat. This seemed contrary to the thesis that all life was created in the first week, for instance. To resolve the issue, a scientist called Francesco Redi (Italy, 1626-97) devised an experiment in 1668, enclosing meat in a container flies could not penetrate and observing whether flies emerged in it. As it turned out, no flies emerged from within the meat, leading Redi to the conclusion that flies lay eggs, and in this case were prevented from doing so.

So well and good. However, suppose Redi *had* found flies in the meat, would he have drawn the conclusion that flies are spontaneously generated? He would have been tempted to do so, since (as far as I was told) he did not foresee alternative theses, such as that flies’ eggs might be carried to the meat like pollen or always present in it like bacteria. If that had been the case, Redi’s inference from the appearance of flies in the meat would have been erroneous. We see from this example the importance of conceiving all possible alternative explanations for a phenomenon, before testing one’s theories.

Note in passing that this is an example of what J. S. Mill much later called ‘the method of residues’[135]. The alternative explanations are listed, then tried out and eliminated one by one, leaving one theory we can still rely on. Of course, the reliability of the residual theory depends on the exhaustiveness of the original list of theories. If all theories are eliminated, we know (from the law of the excluded middle) we need to somehow conceive one more. Sometimes we lack the necessary intelligence or information for that.

A current example of this is the debate in the USA between Creationists and Darwinists. The latter support Darwin’s theory

134 I noted this example in the course of a lecture long ago, so I cannot guarantee my present rendition is entirely accurate. But no matter, I only include it here for purposes of illustration.

135 In his *System of Logic* (1843).

of evolution, and point to the plentiful and varied empirical evidence over billions of years for it (though the issue of origin remains unresolved); while the former support the Biblical idea of sudden emergence of life just a few thousand years ago and suggest “intelligent design” as an alternative outlook. Each group considers that the other’s ideas should not be taught in the classroom.

But, it seems to me, the idea of Divine creation (apart from other specifics of the Biblical narrative) is strictly speaking compatible with Darwinism, if we grant that God chose to institute ‘chance’ evolution (i.e. spontaneous genetic mutations and environmental selection) as the way the life He created in nature would proceed thenceforth. A third alternative is thus conceivable, which reconciles the conflicting theses and allows biology to be peacefully taught in the classroom.

Epistemic Ethics

Logic is not only about forms of reasoning, but also about intellectual style. It is first and foremost a teaching of epistemic ethics: the attitudes the intellect must adopt to arrive at truth. These include suppression of one’s ego, open-mindedness and truth-orientation, among many others.

Genuine philosophers earnestly search for truth. They have sincere questions and try to answer them honestly. They admit areas of doubt or ignorance. They are open to change, and evolve over time.

Fake philosophers play the role of being philosophers, but are really not philosophers. They have little interest in the substance of issues, but seek to dazzle an audience with their superficial erudition and their style. They sow famous names around in the hope of reaping reflected glory. They follow intellectual fashions in pursuit of wide approval ratings, being pious or subversive as befits the current market of ideas. To gain attention and fame, they may be scrupulously conventional or say shocking things.

They say things they do not personally fully understand; they claim to have knowledge they in fact lack. They are apologists for received doctrines, rather than researchers; and when they

seem to propose some new doctrine, it is only by arbitrary opposition to established ideas so as to appear original.

For many people, philosophy is an instrument of social climbing or power over others, rather than a search for truth. Such people may convince many others of this or that absurd or silly doctrine, using the prestige of their position in the education system or in the media, or in some other social role. But in fact, they have only muddled their victims' minds and incapacitated them.

When philosophizing, it is wise to remain low-key and matter-of-fact, avoiding grandstanding and personal emotional outbursts as much as possible. This is an issue of style, not substance. But if one does not exercise sufficient restraint in such discourse, it is very easy to get lost in misleading hyperboles. The wrong choice of language can end up determining our doctrines, causing us to approximate and exaggerate.

Here, I have in mind the likes of Nietzsche or Kierkegaard (and many others), who *pervasively* intertwine their emotional responses with their philosophical realizations. They make a big thing of their personal reactions – writing in a narcissistic manner. Thus, in the face of his insight that man is alone in the universe, without apparent supports – Nietzsche indulges in theatrical outbursts, dramatizing his utter shock, role-playing a heroic response. This is all bombast, designed to give his ego a sense of self-importance; it is a kind of mental equivalent of masturbation. Kierkegaard – "same-same, but different": an equally emotional approach, though a self-pitying one and one with more sincerity.

Such personal reactions were, of course, characteristic of the times and places those philosophers lived in. Their styles seem so "un-modern" – few would indulge in such tonalities today. We are perhaps less flamboyant – but also more careful to avoid confusion between judgments of fact (true–false) and judgments of value (good–bad). Philosophers are human, and may of course be passionate to some extent, and express their personal valuations; but this should not be the centerpiece of their discourse.

The Uncertainty Principle

The Uncertainty Principle of quantum physics, according to which we cannot precisely measure both the position and the momentum of a particle at a given time, may be interpreted either epistemologically (i.e. as an insurmountable practical difficulty of observation and calculation) or ontologically (i.e. as something out there, a truth about the particle itself, such that it does not *have* precise position and momentum). Taken in this neutral manner, it is assumably generally accepted as scientific fact; it is the interpretations of it that are debated.

Classical physics would opt for the epistemological view. This would say that at the phenomenal levels under consideration, any measuring instrument or technique physically affects the objects to be measured, and therefore cannot provide an accurate result – but *we can still hypothesize that* there is an underlying reality, i.e. that the particle does indeed have both position and momentum. Note well that this posture is logically compatible with the notion that the assumed "underlying reality" will never be specifically known, i.e. there is no intent to evade the discovery that it is technically unknowable.

Modern positivism would prefer the ontological interpretation. It would say: no, the immeasurability is not an illusion underlain by definite facts – *we can hypothesize that* the indeterminacy is itself the ultimate reality, the truth of the matter. Note well that this posture is just as hypothetical as the preceding; it cannot claim to know what the "ultimate reality" is any more than the other view, since the common premise is precisely that the reality is technically inaccessible to humans. It is thus just as much a doctrinal stance, however prestigious those who take it are.

Granting the said impossibility of full measurement, it follows that – in this instance at least – each of the two interpretative theses is neither verifiable nor falsifiable. In this context, at least, their logical status is the same – they are equally speculative.

Both postures are admittedly hypothetical, but the former is clearly simpler, the latter philosophically more problematic. One of the principles of scientific method, in any context, is to prefer the simpler thesis unless we have good reasons to seek out a

more complex one. That is, the simpler view is considered inductively more likely, because it is less prone to affect previously established knowledge.

We are not forced to rest content with the classical view; but we must have *sufficient motive* to abandon it in favor of the more complicated positivist view. The latter involves some very revolutionary suppositions about the nature of matter (namely, the possibility of natural spontaneity), which we cannot favor just for the hell of it, merely for the pleasure of challenging the existing order of things. We must first show up some distinctive weakness in the older view or some novel strength in the newer view, to justify such a radical overhaul of all past acquisitions and explanations.

The positivists argue that since we cannot determine these facts precisely, we might as well – for all practical purposes – regard them as non-existent. But the result is not quite the same, because we should consider not only the consequences of such a posture on their particular field of study, but with regard to knowledge as a whole. That is, it is not an innocuous stance – it has wide-ranging ontological and epistemological significance, seemingly putting some important fundamental assumptions of reason (viz. that all natural events are caused) in doubt.

Furthermore, there is no justification in forbidding further discussion of the issue henceforth. The positivists make an argument by intimidation, saying effectively "those who disagree with us are not worthy of intellectual consideration"[136]. But surely, the positivists must still remain open-minded – for they may indeed one day be *proved* wrong, if it should happen that we are able to dig deeper into matter, and eventually find some way to experimentally measure what the uncertainty principle says we cannot.

We cannot empirically prove a "cannot" – a "cannot" is *a generalization* from experience (though, in some cases, it is a

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136 This is also an argument by authority. To which one can answer: one may be a great physicist and a not-so-great philosopher; merit in one field does not guarantee success in all others. Such attitudes are reminiscent of religious authoritarianism.

logical insight, as in the preceding sentence). The uncertainty principle is not a purely empirical fact, plucked out directly from experience; it emerges within a certain theoretical context, which shapes our interpretation of events. This context, like many others throughout the history of science, may yet change, as our knowledge grows. There is no final and incontrovertible scientific theory.

Note well that I am not personally defending one or the other posture here[137], but comparing them from a neutral perspective, giving both fair consideration. That is, I am evaluating *their discourse* as a logician, using a discourse that is pure logic.

137 My neutrality should be evident from the open-minded position I have taken with respect to the idea of natural spontaneity in *The Logic of Causation* (see for example chapter 10.1 there).

29. ABOUT CAUSATION

Drawn from Ruminations (2005), Chapter 8:1-5.

1. Hume's Critique

Hume's denials

David Hume denies the very concept of causality – but in the same breath offers us an explanation of our belief in it, viz. that causal argument proceeds by association of ideas. I have criticized this claim elsewhere[138], but here wish to stress that offering an explanation is claiming to know a cause – therefore, Hume's thesis is self-contradictory.

Nevertheless, there are some grains of truth in his thesis, which by the way explains why it has seemed credible to so many people since he stated it. To see these undercurrents of truth, it is important to distinguish between the issues of how to define causality in general and of how to get to know particular instances of causality.

Clearly, before we can deny causality, we must have some idea what it is we want to deny. Hume admits a simple definition of causality (or rather causation, to be exact) as "constant conjunction," This definition has some truth, but is debatable and ultimately inadequate. Thereafter, the issue arises, can we establish contents fitting this definition. Hume denies it, but (as just pointed out) his denial turns out to be self-defeating.

Hume focused on *our incapacity to apprehend causes immediately*, and suggested that in allegedly 'reasoning' from a cause to an effect (or backwards, from effect to cause) we were merely expressing our mental habit of *ideating certain things together*. Notwithstanding Hume's errors, I would suggest the following to be the undercurrents of truth he was perhaps (though unsuccessfully) trying to bring out:

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138 See *Phenomenology*, chapter 2.5; and *The Logic of Causation*, chapter 16.2.

***Ab initio*, nothing has any apparent cause**. That is to say: causality is not something one can directly observe. ‘Objectivity’ requires that we do not begin our search for knowledge with a prejudice concerning causality in general and about specific causal propositions. Causality and particular cases of it have to be established gradually over time, because the facts logically point us in this direction. We cannot at first sight make such claims with certainty – but (*contra* Hume) this does not exclude the possibility that we can eventually arrive at such conclusions through appropriate logical efforts.

Indeed, causes can be found through *induction*. The method appropriate for finding causes is not deductive – nor for that matter Hume’s ‘association of ideas’ – but inductive. Practical ways to attain such knowledge were first elucidated by Francis Bacon (1605), a century and a half before Hume’s comments. (I have further clarified and developed these methods in my *The Logic of Causation*.) Hume’s thesis rang true in some ears, because he raised awareness that a process was involved. He identified that process as merely psychological; but in fact, it was logical – using inductive logic.

We should, to be precise in the present discussion, refer to volition by others and our less conscious own volitions, as well as to causation, noting that most of our own volitions are known directly and immediately, in the way of self-experience – i.e. ‘intuition’. It is worth pointing out that Hume tacitly admits this last claim when he tries to explain knowledge of causation through ‘association of ideas’ – since *this implies he and the rest of us can look into our mental activities and directly obtain that insight*. Thus, Hume’s attempted critique applies specifically to causation and not to volition, note well.

It should be stressed that the present rejection of Hume’s identification of causal reasoning with mere association of ideas does not imply a denial that we do engage in association of ideas. This mental process does occur. Indeed, it sometimes occurs on the basis of assumed causal connection – but it also, and more often, concerns objects *known to be without* any such connection. The objects of thought may be mentally associated merely because they happened to coexist in our sight *once* for a moment – even if they have *at all other times* been visibly

separate. Moreover, mental association does not require any coexistence *at all ever*, but may occur for quite incidental or accidental reasons. Two things may be mentally associated because of some tiny or vague resemblance, or even simply because we happen to have given them names that sound somewhat the same.

Indeed, Hume's critique depends on these very facts concerning association of ideas for its (illusory) force. If association of ideas was always based on constant conjunction, it would not seem so loose a relation but would indeed suggest underlying causal connection. Thus, Hume on the one hand pretends to equate those two concepts, but on the other hand cunningly exploits their difference, in order to cast doubt on causal reasoning.

Furthermore, he does not explain the distinction we all make between cause and effect, considering that the idea of the effect sometimes (and in some cases, always) mentally precedes that of the cause, even if materially the cause always precedes the effect. Clearly, this opacity is just one aspect of his deliberate confusion between an idea and it object. But such a subjectivist notion is anti-rational, since Hume obviously considers (or wants us to consider) his own skeptical doctrine as objectively true.

Hume's Mentalism

It should be pointed out that Hume's position on causation is *'consistent' with his position on sensory perception*. Given his belief that our apparent perceptions of matter are in fact perceptions of the mental images ("impressions," or "ideas") produced by sensations, and not perceptions of the things that triggered the sensations, it is not strange that he should advocate an "association of ideas" view of causation.

Hume is apparently unaware that this position on perception is logically self-contradictory, because it starts with a belief in matter (including a human body with sense organs, receiving sensory signals and passing them on to the mind), and ends with a denial of it (i.e. an affirmation that all we are able to know are mental impressions or ideas). Moreover, Hume leaves unanswered the question as to *who* has these 'ideas'; i.e. he ignores the Subject.

Hume's concept of association of ideas can also be applied to the other type of causality, namely volition, by effectively denying the existence of a willing self. If volition is *identified with* sequences of mental phenomena like desires, aversions, etc. and perceptible actions of mind and 'body', then there is no need for or place for a concept of a 'self' engaged in willing. Thus, in this view, attitudes, affections and appetites are 'ideas' of sorts, and apparent 'volition' is simply causation at the purely mental level between such ideas and certain 'actions'.

Here, the antinomy consists in leaving unexplained who it is that is associating ideas. If there is no Agent in volition, and no Subject in cognition, no cognitive processes can be depicted as 'in error'. So, how is it that Hume is wiser than the rest of us, and can spot these errors of thought? And moreover, if we have no choice about our mental behavior, what is the purpose of his indicating our errors?

As I have explained elsewhere[139], volition is not a causative relation between *influences* (apprehended conditions) and apparent actions (physical or mental events), but a totally different kind of causal relation, between a soul and its intentions and acts of will. The latter are not phenomenal, but intuited by the Subject. Attitudes, affections and appetites are not substances, but essentially intentions of the self. They influence its acts of will, making them easier or harder; but they are not causatives of them, they are incapable of producing them. The acts of will are caused by the soul, using a causal relation fundamentally different from causation, namely volition.

In both domains, whether through apparent bodily sensations or directly in the mind, Hume seems to consider the arising of 'ideas' (which are thereafter mentally associated) as spontaneous: he is effectively denying all causality. His skeptical view of causality is not based on a thoroughgoing psychology, but is filled with inconsistencies.

Hume, like many philosophers before him and since, approached the issue of causality and other topics in the way of a 'spin

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139 See *Volition and Allied Causal Concepts*, chapters 5-7.

doctor'. He was not scientifically minded, but intent on justifying his philosophical slant of skepticism. I submit: he *wanted* to invalidate our knowledge, and sought pretexts with this goal in mind.

He perhaps only wanted to shock his peers; or maybe he had a perverse wish to destroy human knowledge or to hurt people's minds.

It is legitimate for logic to admonish: such twisted motives are unworthy of philosophers. Philosophers should not bring their personal problems into the public arena in that way. They should approach the subject in a responsible, mentally healthy way, with benevolent intentions. And perhaps the best way to insure such balanced behavior is to lead a pure life….

2. Induction of Causatives

Induction of causative propositions, like for most other kinds of proposition, consists largely in the process of *trying to 'fit-in' the empirical data into this or that morphology* (i.e. **m**, **n**, **p**, **q**, etc.).

The proposition is our (working) hypothesis, while our relevant experiences and memories (the phenomenological facts) are the data used for testing that hypothesis. As usual, we seek for the pattern that will best express and assimilate the data at hand.

The reasoning involved is: 'try this form – does the data fit in it?' – 'no! therefore, this form is not quite appropriate, try another'. This is done repetitively for each set of facts and tentative propositional form.

By trial and error, we repeatedly adapt our estimate of the overall causative relation involved to the available database, which we actively seek to expand.

In formation of a causative proposition, terms (or theses) are variously related according to the conjunctions or non-conjunctions of their presences and/or absences, i.e. through matricial analysis, until the appropriate categorical (or hypothetical) proposition is settled.

Note that this resembles but is not the same as concept formation, where similarity between things is sought and then each new thing is tested for membership.

An example of such 'construction' of a fitting hypothesis (propositional form) is to be found in historical judgment[140] (i.e. trying to formulate general propositions about causation in history) – which is mainly *extensional* in mode.

Note additionally that the disjunction between the specific determinations suggests a possibility of induction by the *factorial analysis* method described in my *Future Logic*.

Incidentally, the word 'conditioning' (often used there) is an apt adjective for all *non-categorical* relations, including conditional propositions (that tell us one item is true, if another is so) in the various modes of modality (in the logical mode these are known as 'hypotheticals') and their disjunctive forms. The term as such is relatively new, dating I gather from the 15th Century – but its root (the Latin *conditio*) is very old, and its underlying meaning is no doubt as old as human reason.

The active form 'conditioning' is admittedly originally intended to balance the passive form 'conditioned', rather than (as sometimes used, by me and others) a general term covering both directions, i.e. the relations of 'conditioning and conditioned' as a whole. But this is a limitation of our language, which in no way renders the term illegitimate. The term is used in this sense not only by logicians, but also by scientists in their theoretical discourse (e.g. by Pavlov) and by common technicians (e.g. 'air conditioning'), because of its causal connotations.

3. True of All Opposites

It is true of *all* opposites (X and nonX) that they invariably *must succeed each other, sometime and somewhere*, in time (natural

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140 See for example Hugh Thomas, *A History of the World*, p. 230 (quote passage) where an explanation for an increase in population is sought (by the above stated means). Many examples may also be found in Darwinist evolution theory. An apt description of extensional causation, by the way, is the phrase "correlation between attributes" (used somewhere by Rosch).

modality) and/or space (extensional modality) and/or in thought (logical modality), and therefore such sequences ought not be regarded as *causative* relations in the strict sense.

For example, we cannot say ‘health causes sickness’ or ‘peace causes war’, just because we observe that the first term (health or peace) invariably precedes the second (sickness or war, respectively)!

Therefore, when we define the causative relation, with reference to conjunctions or non-conjunctions of presences or absences of two or more items, we should, if only parenthetically, except formal relations of mutual exclusion and exhaustiveness between contradictories.

For we normally understand causation as a not-obvious relation, one which we cannot establish a priori. Proposing the sequence of formal opposites as causative provides *no new information* concerning them, since that is a universal given in a world of multiplicity.

Returning to our first example: it is not health that causes sickness, but some germ or virus (say) that attacks the healthy organism and makes it sick. Again, in our second example: it may well be that peace *changes conditions of society in ways that really give rise to* eventual war, or vice versa. But in such case, precise analysis of the causatives involved is required. Certainly, it is not peace *per se* which causes war, but rather (say) the passing of generations and perhaps the rise in wealth and conceit, so that people forget the horror of war and are again willing to engage in it.

4. Extensional to Natural

On tropology or aetiology: We often *reason from extensional to natural modality*, i.e. from transverse observations to longitudinal conclusions, or vice-versa.

Such extrapolation occurs notably in astronomy, where the evolution of stars and galaxies is not observed with reference to one and the same star or galaxy, but by observation of different such entities at presumably different stages of their development, and then hypothesizing a common course of

development for them all, and the assumption that they are each at a different stage along that standard course.

Conversely, in the field of psychology, from the experience of some people with certain pathologies, we assume that under certain circumstances the same could happen to other people. In other words, we are not satisfied with mere ad hoc observations on individuals, but assume some underlying nature or natural structure in common to individuals of the same kind.

Because of such habits, it is important to identify and clarify the forms these reasoning processes take. There are surely many varieties of it, both categorical and conditional. Such leaping from one mode to another *is not formally deductive, but an inductive pattern*. We should perhaps give it a name, to ensure we focus on it – say, "modal extrapolation,"

30. Theory of Negation

Drawn from Ruminations (2005), Chapter 9:1-4,7.

1. Negation in Adduction

Concepts and theories are hypothetical constructs. They cannot (for the most part) be proven (definitely, once and for all), but only repeatedly confirmed by experience. This is the positive side of adduction, presenting evidence in support of rational constructs. This positive aspect is of course indispensable, for without some concrete evidence an abstraction is no more than a figment of the imagination, a wild speculation. The more evidence we adduce for it, the more reliable our concept or theory.

But, as Francis Bacon realized, the account of adduction thus far proposed does not do it justice. Just as important as the positive side of providing evidence, is the negative aspect of it, the rejection of hypotheses that make predictions conflicting with experience. As he pointed out, even if a hypothesis has numerous confirmations, it suffices for it to have *one* such wrong prediction for it to be rejected.

Stepping back, this means that the process of adduction is concerned with selection of the most probable hypothesis among two or more (already or yet to be conceived) explanations of fact. Each of them may have numerous ‘positive instances’ (i.e. empirical evidence that supports it); and so long as they are all still competitive, we may prefer those with the most such instances. But, the way we decisively advance in our conceptual/theoretical knowledge is by the successive *elimination* of propositions that turn out to have ‘negative instances’ (i.e. empirical evidence against them).

Now all the above is well known and need not be elucidated further. This theory of inductive logic has proven extremely successful in modern times, constituting the foundation of the scientific method.

But upon reflection, the matter is not as simple and straightforward as it seems at first!

Consider, for example, the issue of whether or not there is water on Mars. It would seem that the proposition "There is water on Mars" is far easier to prove inductively than the contradictory proposition "There is no water on Mars," Both propositions are hypotheses.

The positive thesis would be somewhat confirmed, if it was discovered using certain instruments from a distance that there are serious indices that water is present; the thesis would be more solidly confirmed, if a sample of Mars was brought back to Earth and found upon analysis to contain water. In either case, the presence of water on Mars would remain to some (however tiny) degree unsure, because some objection to our instrumental assumptions might later be raised or the sample brought back may later be found to have been contaminated on the way over. Nevertheless, something pretty close to certainty is conceivable in this matter.

The negative thesis, by contrast, is much more difficult to prove by experience. We can readily assume it to the extent that the positive thesis has not so far been greatly confirmed. That is, so long as we have not found evidence for the positive thesis (i.e. water on Mars), we should rather opt for the negative thesis. But the latter is only reliable to the degree that we tried and failed to confirm the former. If we earnestly searched for water every which way we could think of, and did not find any, we can with proportionate confidence assume there is no water.

Thus, in our example, the negative thesis is actually *more difficult* to establish than the positive one. It *depends on a generalization*, a movement of thought from "Wherever and however we looked for water on Mars, ***none was found***" to "***There is no*** water on Mars," However, note well, it remains conceivable that a drop of water be found one day somewhere else on Mars, centuries after we concluded there was none.

Granting this analysis, it is clear that Bacon's razor that "What is important is the negative instance" is a bit simplistic. It assumes that a negative is as accessible as (if not, indeed, more accessible than) a positive, which is not always the case.

In practice, a negative may be inductively more remote than a positive. Granting this conclusion, the question arises – is the negative instance *ever* more empirically accessible than (or even as accessible as) the positive one? That is, *when* does Bacon's formulation of induction actually come into play?

If we look at major historical examples of rejection of theories, our doubt may subsist. For example, Newtonian mechanics was in place for centuries, till it was put in doubt by the discovery of the constancy of the velocity of light (which gave rise to Relativity theory) and later again by the discovery of various subatomic phenomena (which gave rise to Quantum mechanics). In this example, the 'negative instances' were essentially 'positive instances' – the only thing 'negative' about them was just their negation of the Newtonian worldview!

Such reflections have led me to suspect that the 'negation' referred to by Bacon is only meant *relatively* to some selected abstraction. His razor ought not be taken as an advocacy of absolute negation. If we look at the matter more clearly, we realize that the data used to thus negate an idea is essentially positive. A deeper consideration of the nature of negation is therefore patently called for.

2. Positive and Negative Phenomena

People have always considered that there is a difference between a positive and a negative term. Indeed, that is why logicians have named them differently. But logicians have also found it difficult to express that difference substantially. Yet, there are significant phenomenological differences between positive and negative phenomena.

a. The concrete material and mental world is evidently composed only of positive particular phenomena, some of which we perceive (whether through the bodily senses or in our minds). These exist at least as appearances, though some turn out to seem real and others illusory. This is an obvious phenomenological, epistemological and ontological truth.

To say of phenomena that they are 'particular' is to express awareness that they are always limited in space and time. They

have presence, but they are finite and transient, i.e. manifestly characterized by diversity and change.

We do not ordinarily experience anything concrete that stretches uniformly into infinity and eternity (though such totality of existence might well exist, and indeed mystics claim to attain consciousness of it in deep meditation, characterizing it as “the eternal present”). We do commonly consider some things as so widespread. ‘Existence’ is regarded as the substratum of all existents; ‘the universe’ refers to the sum total of all existents; and we think of ‘space-time’ as defining the extension of all existents. But only ‘existence’ may be classed as an experience (a quality found in all existents); ‘the universe’ and ‘space-time’ must be admitted as abstractions.

However, the limits of particulars are perceivable without need of negation of what lies beyond them, simply due to the variable concentration of consciousness, i.e. the direction of focus of attention. That is, though ‘pointing’ to some positive phenomenon (e.g. so as to name it) requires some negation (we mean “this, but not that”), one can notice the limits of that phenomenon independently of negation.

b. Negative phenomena (and likewise abstracts, whether positive or negative), on the other hand, do depend for their existence on a Subject/Agent – a cognizing ‘person’ (or synonymously: a self or soul or spirit) with consciousness and volition looking out for some remembered or imagined positive phenomenon and failing to perceive it (or in the case of abstracts, comparing and contrasting particulars).

Thus, negative particular phenomena (and more generally, abstracts) have a special, more ‘relative’ kind of existence. They are not as independent of the Subject as positive particular phenomena. That does not mean they are, in a Kantian sense, ‘a priori’ or ‘transcendental’, or purely ‘subjective’ – but it does mean that they are ontological potentials that are only realized in the context of (rational) cognition.

Another kind of experience is required for such realization – the self-experience of the Subject, his intuitive knowledge of his cognitions and volitions. This kind of experience, being

immediate, may be positive or negative without logical difficulty. The Subject reasons inductively as follows:

> I am searching for X;
> *I do not* find X;
> Therefore, X "*is not"* there.

The negative conclusion may be 'true' or 'false', just like a positive perception or conclusion. It is true to the degree that the premises are true – i.e. that the alleged search for X was diligent (intelligent, imaginative, well-organized, attentive and thorough), and that the alleged failure to find X is not dishonest (a lie designed to fool oneself or others).

Whence it is fair to assert that, unlike some positive terms, negative terms are never based *only* on perception; they *necessarily* involve a thought-process – the previous mental projection or at least intention of the positive term they negate.

This epistemological truth does reflect an ontological truth – the truth that the 'absences' of phenomena lack phenomenal aspects. A 'no' is not a sort of 'yes'.

Note well the logical difference between '**not perceiving X**' and '**perceiving not X**'. We do not have direct experience of the latter, but can only indirectly claim it by way of *inductive inference* (or extrapolation) from the former. In the case of a positive, such process of reasoning is not needed – one often can and does 'perceive X' directly.

Suppose we draw a square of opposition for the propositions (labeling them by analogy to standard positions) – "I perceive X" (A), "I do not perceive not X" (I), "I perceive not X" (E), "I do not perceive X" (O). Here, the A form is knowable by experience, whereas the I form is knowable perhaps only by deductive implication from it. On the negative side, however, the E form is not knowable by experience, but only by inductive generalization from the O form (which is based on experience).

3. Positive Experience Precedes Negation

Negation is a pillar of both deductive and inductive logic, and requires careful analysis. We have to realize that negative terms are fundamentally distinct from positive ones, if we are to begin fathoming the nature of logic. The following observation seems to me crucial for such an analysis:

> ***We can experience something positive without having first experienced (or thought about) its negation, but we cannot experience something negative without first thinking about (and therefore previously having somewhat experienced) the corresponding positive.***

a. Cognition at its simplest is perception. Our perceptions are always *of positive particulars*. The contents of our most basic cognitions are phenomenal sights, sounds, smells, tastes, and touch and other bodily sensations that seemingly arise through our sense organs interactions with matter – or mental equivalents of these phenomena that seemingly arise through memory of sensory experiences, or in imaginary re-combinations of such supposed memories.

A positive particular can be experienced directly and passively. We can just sit back, as it were, and receptively observe whatever happens to come in our field of vision or hearing, etc. This is what we do in meditation. We do not have to actively think of (remember or visualize or conceptualize) something else in order to have such a positive experience. Of course, such observation may well in practice be complicated by thoughts (preverbal or verbal) – but it is possible in some cases to have a pure experience. This must logically be admitted, if concepts are to be based on percepts.

b. In the case of *negative particulars*, the situation is radically different. A negative particular has *no* specific phenomenal content, but is *entirely* defined by the 'absence' of the phenomenal contents that constitute some positive particular. If I look into my material or mental surroundings, I will always see present phenomena. The absence of some phenomenon is

only noticeable if we first think of that positive phenomenon, and wonder whether it is present.

It is accurate to say that our finding it absent reflects an empirical truth or fact – but it is a fact that we simply would not notice the negative without having first thought of the positive. Negative knowledge is thus necessarily (by logical necessity) more indirect and active. It remains (at its best) perfectly grounded in experience – but such negative experience requires a rational process (whether verbal or otherwise).

To experience a negative, I must first imagine (remember or invent) a certain positive experience; then I must look out and see (or hear or whatever) whether or not this image matches my current experience; and only then (if it indeed happens not to) can I conclude to have "experienced" a negative.

Thinking about X may be considered as positioning oneself into a vantage point from which one can (in a manner of speaking) experience not-X. If one does not first place one's attention on X, one cannot possibly experience the negation of X. One may well experience all sorts of weird and wonderful things, but not specifically not-X.

From this reflection, we may say that whereas affirmatives can be experienced, negatives are inherently rational acts (involving imagination, experience and intention). A negative necessarily involves thought: the thought of the corresponding positive (the imaginative element), the testing of its presence or absence (the experiential element) and the rational conclusion of "negation" (the intentional element).

c. The negation process may involve words, though it does not have to.

Suppose I have some momentary experience of sights, sounds, etc. and label this positive particular "X," The *content of consciousness* on which I base the term X is a specific set of positive phenomenal experiences, i.e. physical and/or mental percepts. Whenever I can speak of this X, I mentally *intend* an object of a certain color and shape that moves around in certain ways, emitting certain sounds, etc.

Quite different is the negation of such a simple term, "not X," The latter is not definable by any specific percepts – it *refers to*

no perceptible qualities. It cannot be identified with the positive phenomena that happen to be present in the absence of those constituting X. Thus, strictly speaking, not-X is only definable by 'negation' of X.

Note well, it would not be accurate to say (except ex post facto) that not-X refers to all experiences other than X (such as Y, Z, A, B, etc.), because when I look for X here and now and fail to find it, I am only referring to present experience within my current range and not to all possible such experiences. We would not label a situation devoid of X as "not X" *without thinking of X*; instead, we would label that situation in a positive manner (as "Y," or "Z," or whatever).

Thus, we can name (or wordlessly think of) something concrete "X," *after* experiencing phenomena that constitute it; but in the case of "not-X," we necessarily conjure the name (or a wordless thought) of it *before* we experience it.

"Not-X" is thus already a concept rather than a percept, even in cases where "X" refers to a mere percept (and all the more so when "X" itself involves some abstraction – as it usually does). The concept "not X" is hypothetically constructed first and then confirmed by the attempted and failed re-experience of X.

In short, negation – even at the most perceptual level – involves an adductive process. It is never a mere experience. A negative term never intends the simple perception of some negative thing, but consists of a hypothesis with some perceptual confirmation. Negation is always conceptual as well as perceptual in status.

A theory cannot be refuted before it is formulated – similarly, X cannot be found absent unless we first think of X.

4. Negation is an Intention

Now, there is no specific phenomenal experience behind the word "not," Negation has no special color and shape, or sound or smell or taste or feel, whether real or illusory! What then is it? I suggest the following:

Negation as such refers to a 'mental act' – or more precisely put, it is an act of volition (or more precisely still, of velleity) by a

Subject of consciousness. Specifically, *negation is an intention*. Note that our will to negate is itself *a positive act*, even though our intention by it is to negate something else.

Negation does express an experience – the ‘failure’ to find something one has searched for. Some cognitive result is willfully pursued (perception of some positive phenomenon), but remains wanting (this experience is qualitatively a suffering of sorts, but still a positive intention, note) – whence we mentally (or more precisely, by intention) mark the thing as ‘absent’, i.e. we construct an idea of ‘negation’ of the thing sought.

Thus, negation is *not a phenomenon* (a physical or mental percept), *but something intuited* (an event of will within the cognizing Subject). ‘Intuition’ here, note well, means the self-knowledge of the Subject of consciousness and Agent of volition. This is experience of a *non-phenomenal* sort. Such self-experience is immediate: we have no distance to bridge in space or time.

When a Subject denies the presence of a material or mental phenomenon, having sought for it in experience and not found it – the ‘denial’ consists of a special act of intention. This intention is what we call ‘negation’ or ‘rejection of a hypothesis’. It occurs in the Subject, though it is about the Object.

This intention is not however an arbitrary act. If it were, it would be purely subjective. This act (at its best) remains sufficiently dependent on perception to be judged ‘objective’. The Subject must still look and see whether X is present; if that positive experience does not follow his empirical test, he concludes the absence of X.

Indeed, an initial negation may on closer scrutiny be found erroneous, i.e. we sometimes think something is ‘not there’ and then after further research find it on the contrary ‘there’. Thus, this theory of negation should not be construed as a claim that our negating something makes it so. Negation is regulated by the principles of adduction – it is based on appearance that is credible so long as confirmed, but may later be belied.

We can ex post facto speak of an objective absence, but we cannot fully define ‘absence’ other than as ‘non-presence’, and the ‘non-’ herein is not a phenomenon but an intention. The

'absence' is indeed experienced, but it is *imperceptible* without the Subject posing the prior question 'is X present?'

Absence, then, is not produced by the Subject, but is made perceptible by his vain search for presence. For, to repeat, not-X is not experienced as a specific content of consciousness – but as a continuing failure to experience the particular positive phenomena that define X for us.

Although we are directly only aware of apparent existents, we can inductively infer non-apparent existents from the experience that appearances come and go and may change. On this basis, we consider the categories 'existence' and 'appearance' as unequal, and the former as broader than the latter. Similarly, we inductively infer 'objective absence' from 'having sought but not found', even though we have no direct access to former but only indirect access by extrapolation from the latter. Such inference is valid, with a degree of probability proportional to our exercise of due diligence.

For these reasons, I consider the act of negation as an important key to understanding the nature and status of logic. Negation is so fundamental to reason, so crucial an epistemic fact, that it cannot be reduced to something else.

We can describe it *roughly* as an intention to 'cross-off' (under the influence of some reason or other) the proposed item from our mental list of existents. But this is bound to seem like a circular definition, or a repetition of same using synonyms. It is evident that *we cannot talk about negation without engaging in it*. Thus, we had better admit the act of negation as a primary concept for logical science.

Note in passing: the present theory of negation provides biology with an interesting distinction regarding rational animals.

Sentient beings without this faculty of negation can only respond to the present, whereas once this faculty appears in an organism (as it did in the human species) it can mentally go beyond the here and now. A merely sensory animal just reacts to current events, whereas a man can fear dangers and prepare for them.

Once the faculty of negation appears, the mind can start *abstracting, conceiving alternatives and hypothesizing*. Memory and imagination are required to project a proposed positive idea,

but the intent to negate is also required to reject inadequate projections. Without such critical ability, our fantasies would quickly lead us into destructive situations.

5. Pure Experience

A logically prior issue that should perhaps be stressed in this context is the existence of pure experience, as distinct from experience somewhat tainted by acts of thought.

Some philosophers claim that all alleged 'experience' falls under the latter class, and deny the possibility of the former. But such skepticism is clearly inconsistent: if we recognize some *part* of some experience as pure of thought, this is sufficient to justify a claim to *some* pure experience. Thus, the proposition "There are some pure experiences" may be taken as an axiom of logic, phenomenology, epistemology and ontology. This proposition is self-evident, for to deny it is self-contradictory.

Note that this proposition is more specific than the more obvious "There are experiences," Denial of the latter is a denial of the evidence before one's eyes (and ears and nose and tongue and hands, etc. – and before one's "mind's eye," too): it directly contravenes the law of identity. Philosophers who engage in such denial have no leg to stand on, anyway - since they are then hard put to at all explain what meaning the concepts they use in their denial might possibly have. We have to all admit *some* experience – some appearance in common (however open to debate) – to have anything to discuss (or even to be acknowledged to be discussing).

Let us return now to the distinction between pure and tainted experiences. This concerns the involvement of thought processes of any kind – i.e. of ratiocinations, acts of reason. To claim that there are pure experiences is not to deny that some (or many or most) experiences are indeed tainted by conceptual activity (abstraction, classification, reasoning, etc.)

We can readily admit that all of us very often have a hard time distinguishing pure experience from experience mixed with rational acts. The mechanisms of human reason are overbearing and come into play without asking for our permission, as is

evident to anyone who tries to meditate on pure experience. It takes a lot of training to clearly distinguish the two in practice.

But surely, any biologist would admit that lower animals, at least, have the capacity to experience without the interference of thought, since they have no faculty of thought. The same has to be true to some extent for humans – not only in reflex actions, but also in the very fact that reasoning of any sort is only feasible in relation to pre-existing non-rational material. To process is to process something.

I have already argued that what scientists call ‘experiment’ cannot be regarded as the foundation of science, but must be understood as a mix of intellectual (and in some cases, even physical acts) and passive observation (if only observation of the results of experiment displayed by the detection and measuring instruments used). Thus, observation is cognitively more fundamental than experiment.

Here, my purpose is to emphasize that perceptual ‘negation’ is also necessarily a mix of pure experience and acts of the intellect. It is never pure, unlike the perception of positive particulars (which sometimes is pure, necessarily) – because it logically cannot be, since to deny anything one must first have something in mind to deny (or affirm).

Thus, negation can be regarded as one of the most primary acts of reason – it comes before abstraction, since the latter depends to some extent on making distinctions, which means on negation.

31. THE SIGNIFICANCE OF NEGATION

Drawn from Ruminations (2005), Chapter 9:5-6,8-10.

1. Formal Consequences

Returning to logic – our insight here into the nature of negation can be construed to have *formal* consequences. The negative term is now seen to be a radically different kind of term, even though in common discourse it is made to behave like any other term.

We cannot point to something as 'negative' except insofar as it is the negation of something positive. This remark is essentially logical, not experiential. The term 'not' has no substance per se – it is a purely relative term. The positive must be experienced or thought of before the negative can at all be conceived, let alone be specifically sought for empirically. This is as true for intuitive as for material or mental objects; and as true for abstracts as for concretes.

One inference to draw from this realization of the distinction of negation is: "non-existence" is not some kind of "existence," Non-existent things cannot be classed under existence; they are not existent things. The term "non-existence" involves no content of consciousness whatsoever – it occurs in discourse only as the verbal repository of any and all denials of "existence," Existentialist philosophers have written volumes allegedly about "non-being," but as Parmenides reportedly stated:

"You cannot know not-being, nor even say it."

This could be formally expressed and solidified by saying that ***obversion*** (at least that of a negative – i.e. inferring "This is nonX" from "This is not X") is essentially an artificial process. If so, the negative predicate (nonX) is not always inferable from the negative copula (is not). In other words, the form "There is

no X" does not imply "There is non-X;" or conversely, "X does not exist" does not imply "nonX exists,"

We can grant heuristically that such eductive processes work in most cases (i.e. lead to no illogical result), but they may be declared invalid in certain extreme situations (as with the term "non-existence")! In such cases, "nonX" is 'just a word'; it has no conscionable meaning – we have no specific thing in mind as we utter it.

Logicians who have not yet grasped the important difference of negation are hard put to explain such formal distinctions. I know, because it is perhaps only in the last three years or so that this insight about negation has begun to dawn on me; and even now, I am still in the process of digesting it.

Note that a philosophical critic of this view of negation cannot consider himself an objective onlooker, who can hypothesize 'a situation where absence exists but has not or not yet been identified'. For that critic is himself a Subject like any other, who must explain the whence and wherefore of his knowledge like anyone else – including the negatives he appeals to. No special privileges are granted.

That is, if you wish to deny all the above, ask yourself and tell me how you consider you go about denying without having something to deny! Claiming to have knowledge of a negative without first thinking of the corresponding positive is comparable to laying personal claim to an absolute framework in space-time – it is an impossible exercise for us ordinary folk.

It should also be emphasized that the above narrative describes only the simplest kind of negation: negation of a perceptual item. But most of the time, in practice, we deal with far more complex situations. Even the mere act of 'pointing' at some concrete thing involves not only a positive act ("follow my finger to this"), but also the act of negation ("I do not however mean my finger to point at that").

Again, a lot of our conceptual arsenal is based on imaginary recombinations of empirical data. E.g. I have seen "pink" things and I have seen "elephants," and I wonder whether "pink elephants" perhaps exist. Such hypothetical entities are then tested empirically, and might be rejected (or confirmed).

However, note, abstraction does not depend only on negation, but on quantitative judgments (comparing, and experiencing what is more or less than the other).

Abstraction starts with experiences. These are variously grouped through comparisons and contrasts. Negation here plays a crucial role, since to group two things together, we must find them not only similar to each other but also different from other things. This work involves much trial and error.

But at this level, not only denial but also affirmation is a rational act. For, 'similarity' means seemingly having some quality in common in some measure, although there are bound to be other qualities not in common or differences of measure of the common quality. The essence of affirmation here is thus 'measurement'.

But Nature doesn't measure anything. Every item in it just is, whatever it happens to be (at any given time and place). It is only a Subject with consciousness that measures: this against that, or this and that versus some norm.

This weighing work of the cognizing Subject is not, however, arbitrary (or ought not to be, if the Subject has the right attitudes). As in the above case of mere negation, the conclusion of it does proceed from certain existing findings. Yet, it is also true that this work only occurs in the framework of cognition.

2. Negation and the Laws of Thought

Logic cannot be properly understood without first understanding negation. This should be obvious from the fact that two of the laws of thought concern the relation between positive and negative terms. Similarly, the basic principle of adduction, that hypotheses we put forward should be empirically tested and rejected if they make wrong predictions – this principle depends on an elucidation of negation.

a. The so-called laws of thought are, in a sense, laws of the universe or ontological laws – in that the universe is what it is (identity), is not something other than what it is (non-contradiction) and is something specific (excluded middle).

They have phenomenological aspects: appearances appear (identity); some are in apparent contradiction to others (a contradiction situation); in some cases, it is not clear just what has appeared (an excluded middle situation).

They may also be presented as epistemological laws or laws of logic, in that they guide us in the pursuit of knowledge. However, they are aptly named laws of thought, because they really arise as propositions only in the context of cognitive acts.

To understand this, one has to consider the peculiar status of negation, as well as other (partly derivative) major processes used in human reasoning, including abstraction, conceiving alternative possibilities and making hypotheses.

b. The impact of this insight on the laws of thought should be obvious. The law of identity enjoins us primarily to take note of the *positive* particulars being perceived. But the laws of non-contradiction and of the excluded middle, note well, both involve *negation*. Indeed, that's what they are all about – their role is precisely *to regulate our use of negation* – to keep us in harmony with the more positive law of identity!

Their instructions concerning the subjective act of negation, at the most perceptual level, are as follows. The law of non-contradiction ***forbids negating in the perceptible presence of the thing negated***. The law of the excluded middle ***forbids accepting as final an uncertainty as to whether a thing thought of is currently present or absent***.

We are unable to cognize a negative (not-X) except by negation of the positive (X) we have in mind; it is therefore absurd to imagine a situation in which both X and not-X are true (law of non-contradiction). Similarly, if we carefully trace how our thoughts of X and not-X arise in our minds, it is absurd to think that there might be some third alternative between or beyond them (law of the excluded middle.)

Thus, these two laws are not arbitrary conventions or happenstances that might be different in other universes, as some logicians contend (because they have unfortunately remained stuck at the level of mere symbols, "X" and "non-X," failing to go deeper into the cognitive issues involved). Nor are they wholly subjective or wholly objective.

These laws of thought concern the interface of Subject and Object, of consciousness and existence – for any Subject graced with rational powers, i.e. cognitive faculties that go beyond the perceptual thanks in part to the possibility of negation.

They are for this reason applicable universally, whatever the content of the material and mental universe faced. They establish for us *the relations* between affirmation and denial, for any and every content of consciousness.

c. On this basis, we can better comprehend the ontological status of the laws of thought. They have no actual existence, since the concrete world has *no use for or need* of them, but exists self-sufficiently in positive particulars.

But the laws are a potential of the world, which is actualized when certain inhabitants of the world, who have the gifts of consciousness and freewill, resort to negation, abstraction and other cognitive-volitional activities, in order to summarize and understand the world.

In a world devoid of humans (or similar Subject/Agents), there are no negations and no 'universals'. Things just are (i.e. appear) – positively and particularly. Negation only appears in the world in relation to beings like us who can search for something positive and not find it. Likewise for 'universals' – they proceed from acts of comparison and contrast.

Consciousness and volition are together what gives rise to concepts and alternative possibilities, to hypotheses requiring testing. It is only in their context that logical issues arise, such as existence or not, reality or illusion, as well as consistency and exhaustiveness.

It is important to keep in mind that the laws of thought are themselves complex abstractions implying negations – viz. the negative terms they discuss, as well as the negation of logical utility and value in contradictory or 'middle' thinking. Indeed, all the 'laws' in our sciences are such complex abstractions involving negations.

d. The insight that negation is essentially a volitional act allied to cognition explains why the laws of thought are prescriptive as well as descriptive epistemological principles.

The laws of thought are prescriptive inasmuch as human thought is fallible and humans have volition, and can behave erratically or maliciously. If humans were infallible, there would be no need for us to study and voluntarily use such laws. There is an ethic to cognition, as to all actions of freewill, and the laws of thought are its top principles.

The laws of thought are descriptive, insofar as we commonly explicitly or implicitly use them in our thinking. But this does not mean we all always use them, or always do so correctly. They are not 'laws' in the sense of reports of universal behavior. Some people are unaware of them, increasing probabilities of erroneous thinking. Some people would prefer to do without them, and eventually suffer the existential consequences. Some people would like to abide by these prescriptions, but do not always succeed.

These prescriptions, as explicit principles to consciously seek to abide by, have a history. They were to our knowledge first formulated by a man called Aristotle in Ancient Greece. He considered them to best describe the cognitive behavior patterns that lead to successful cognition. He did not invent them, but realized their absolute importance to human thought.

Their justification is self-evident to anyone who goes through the inductive and deductive logical demonstrations certain logicians have developed in this regard. Ultimately it is based on a holistic consideration of knowledge development.

Our insights here about the relativity of negation and abstraction, and the realization of their role in the laws of thought serve to further clarify the necessity and universality of the latter.

3. Consistency is Natural

It is important to here reiterate the principle that *consistency is natural*; whereas inconsistency is exceptional.

Some modern logicians have come up with the notion of "proving consistency" – but this notion is misconceived. Consistency is the natural state of affairs in knowledge; it requires no (deductive) proof and we are incapable of providing such proof, since it would be 'placing the cart before the horse'.

The only possible 'proof' of consistency is that no inconsistency has been encountered. Consistency is an inductive given, which is very rarely overturned. All our knowledge may be and must be assumed consistent, unless and until there is reason to believe otherwise.

In short: harmony generally reigns unnoticed, while conflicts erupt occasionally to our surprise. One might well wonder now if this principle is itself consistent with the principle herein defended that negatives are never per se objects of cognition, but only exist by denial of the corresponding positives. Our principle that consistency is taken for granted seems to imply that we on occasion have logical insights of *in*consistency, something negative!

To resolve this issue, we must again emphasize the distinction between pure experience and the *interpretations* of experience that we, wordlessly (by mere intention) or explicitly, habitually infuse into our experiences. Generally, almost as soon as we experience something, we immediately start interpreting it, dynamically relating it to the rest of our knowledge thus far. Every experience almost unavoidably generates in us strings of associations, explanations, etc.

The contradictions we sometimes come across in our knowledge do not concern our pure experiences (which are necessarily harmonious, since they in fact exist side by side – we might add, quite 'happily'). *Our contradictions are necessarily contradictions between an interpretation and a pure experience, or between two interpretations*. Contradictions do not, strictly-speaking, reveal difficulties in the raw data of knowledge, but merely in the hypotheses that we conceived concerning such data.

Contradictions are thus to be blamed on reason, not on experience. This does not mean that reason is necessarily faulty, but only that it is fallible. Contradictions ought not be viewed as tragic proofs of our ignorance and stupidity – but as helpful indicators that we have misinterpreted something somewhere, and that this needs reinterpretation. These indicators are precisely one of the main tools used by the faculty of reason to

control the quality of beliefs. The resolution of a contradiction is just new interpretation.

How we know that two theories, or a theory and some raw data, are ‘in contradiction’ with each other is a moot question. We dismiss this query rather facilely by referring to “logical insight,” Such insight is partly ‘experiential’, since it is based on scrutiny of the evidence and doctrines at hand. But it is clearly not entirely empirical and involves abstract factors. ‘Contradiction’ is, after all, an abstraction. I believe the answer to this question is largely given in the psychological analysis of negation.

There is an introspective sense that *conflicting intentions* are involved. Thus, the ‘logical insight’ that there is inconsistency is not essentially insight into a negative (a non-consistency), but into a positive (the intuitive experience of conflict of intentions). Although the word inconsistency involves a negative prefix, it brings to mind something empirically positive – a felt tension between two theses or a thesis and some data.

For this reason, to say that ‘consistency is assumable, until if ever inconsistency be found’ is consistent with our claim that ‘negations are not purely empirical’. (Notice incidentally that we did not here “prove” consistency, but merely *recovered* it by clarifying the theses involved.)

The above analysis also further clarifies how the law of non-contradiction is expressed in practice. It does not sort out experiences as such, but concerns more abstract items of knowledge. To understand it fully, we must be aware of the underlying intentions. A similar analysis may be proposed to explain the law of the excluded middle.

In the latter case, we would insist that (by the law of identity) ‘things are something, what they are, whatever that happen to be’. Things cannot be said to be *neither* this *nor* the negation of this, because such characterizations are negative (and, respectively, doubly negative) – and therefore cannot constitute or be claimed as positive experience. Such situations refer to uncertainties *in the knower*, which he is called upon to eventually fill-in. They cannot be proclaimed final knowledge

(as some modern sophists have tried to do), but must be considered temporary postures in the pursuit of knowledge.

4. Status of the Logic of Causation

It should be pointed out that the theory of negation here defended has an impact on our theory of causation. If causation relates to the conjunctions *and non*-conjunctions of presences *and absences* of two or more items – then our knowledge of causes (i.e. causatives) is subsidiary to judgments of negation. It follows that ***the logic of causation is not "purely empirical,"*** but necessarily involves acts of reason (namely the acts of negation needed to declare something absent or two or more things not conjoined).

Incidentally, we can also argue that causative judgments are not purely empirical with reference to the fact that it always concerns *kinds* of things rather than individual phenomena. Truly individual phenomena are by definition unrepeated and so cannot strictly be said to be present more than once, let alone said to be absent. Causation has to do with *abstractions* – it is conceptual, it concerns classes of things. In this regard, too, causation depends on rational acts.

These features of causation do not make it something non-existent, unreal or invalid, however. The skeptic who tries to make such a claim is also engaged in negation and abstraction – and is therefore implicitly suggesting his own claim to be non-existent, unreal or invalid! One cannot use rational means to deny reason. It is obviously absurd to attempt such intellectual convolutions, yet many have tried and keep trying.

The polemics of Nagarjuna and David Hume are examples of such sophism. As I have shown in previous writings, they try to deny causation without even defining it properly (and likewise for other rational constructs). This is a case of the fallacy I have identified more generally in the present reflections – namely, *the attempt to deny something before one even has something to deny*. What are they disputing if indeed there is nothing to discuss?

As we have seen, awareness of the distinctiveness of negative terms can have consequences on logical practice. Generally speaking, a negative term (i.e. one contradicting a positive term) is more naturally a predicate rather than a subject of (categorical) propositions. Similarly, the negation of a proposition is more naturally a consequent than an antecedent.

Using a negative term as a propositional subject is sometimes a bit artificial, especially if the proposition is general. When we so use a negative term, we tacitly understand that a set of alternative contrary positive terms underlie it. That is to say, given "All non-A are B," we should (and often do) look for disjuncts (say C, D, E, etc.) capable of replacing non-A.

In the case of a causative proposition, the positive side of the relation may be more effective than the negative side, even when the latter is the stronger. That is, when the causative seems on the surface to be a negation, we should (and often do) look deeper for some positive term(s) as the causative.

This recommendation can only, however, be considered heuristic. Formal rules remain generally valid.

5. Zero, One and More

Another consequence of the theory of negation has to do with the foundations of **mathematics**. What is the number 'zero' (0)? It refers to the 'absence' of units of some class in some domain. And of course, we can here reiterate that there is no possibility of concretely identifying such absence, without having first sought out the presence of the units concerned. Therefore, here too we can say that there is a sort of relativity to a Subject/Agent (who has to seek out and not find a certain kind of unit).

But of course, not only zero is 'relative' in this sense. We could say that the only purely empirical number is the unit, one (1). It is the only number of things that can be perceived directly, without processing information. As we said earlier, there are only positive particulars. We may here add: each of them is 'only a unit', never 'one of many'.

Such units may be mentally (verbally or even just intentionally) grouped together, by means of some defining rule (which may

just be a circle drawn in the dust around physical units, or a more abstract common and exclusive characteristic). We thus form natural numbers larger than one (such as 2, 3, etc.) *by abstraction*. It follows that any number larger than one (as in the case of zero) can be actualized *only if there is someone there to do the counting*.

Thus, zero and the natural numbers larger than one are less directly empirical than the unit; they are conceptual constructs. It still remains true that '2+2 = 4' or false that '2+2 = 5' – but we do not get to know such truth or falsehood just by 'looking' out at the world: a rational process (partly inductive, partly deductive) is required of us. If no one with the needed cognitive powers was alive, only units would actually exist – other numbers would not appear.

And if this dependence on someone counting is true of whole numbers, it is all the more true of fractions, decimals and even more abstract numerical constructs (e.g. imaginary numbers). As for 'infinity', it is obviously the most abstract of numerical constructs – considering, too, the negativity it involves by definition.

But we can go one step further in this analysis, and re-examine our above notion of a purely empirical unit! Implicit in this notion is that what appears before us (in the various sensory media, and their mental equivalents) is a multiplicity of distinct units. This already implies plurality – the existence of many bits and pieces in a given moment of appearance (different shapes, colors, sounds, etc.), and/or the existence of many moments of appearance (across 'time', as suggested by 'memory').

But multiplicity/plurality does not appear before us through mere observation. It is we (those who are conscious of appearances) who 'sort out' the totality of appearance into distinct bits and pieces (e.g. physical or mental, or sights and sounds, or blue and white), or into present phenomena and memories of phenomena. We do this by means of intentions and mental projections (acts of will, sometimes involving imagination), in an effort to summarize and 'make sense of' the world we face.

Thus, to speak of 'positive particulars' as pure percepts (or in some cases, as objects of intuition) is not quite accurate as phenomenology. The starting data of all knowledge is a *single* undifferentiated mass of all our experience. This is split up and ordered in successive stages.

Consider my field of experience at a given moment – say, for simplicity, I look up and see a solitary bird floating in the blue sky, i.e. two visual objects (ignoring auditory and other phenomenal features), call them x and y.

Initially (I postulate), they are one experience. Almost immediately, however, they are distinguished from each other (I postulate this true even for a static moment[141], but it is all the more easy to do as time passes and the bird flies through different parts of the sky, and other birds and clouds come into the picture).

This basic distinction is based on the fact that the bird has a shape and color that visually 'stand out' from the surrounding blue of the sky, i.e. by virtue of contrast. This may be called '**imagined separation**', and involves a mental projection (or at least, an intention) of imaginary boundaries between the things considered.

It need not (I again postulate) involve negations. That is, I make a distinction because x is x and y is y, not because x is not-y and y is not-x. The latter negations can only logically occur *as an afterthought*, once the former contrasts give me separate units I can negate.

The acknowledgment of 'many' things within the totality of experience (a sort of epistemological initial 'big bang') is already a stage of ratiocination. Negation is yet another of those stages, occurring perhaps just a little after that. Numbers are yet a later stage, dependent on negation (since to explicitly distinguish things from each other we need negation).

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141 Of course, the observer of the static moment *takes time* to make a distinction between items within it. But there is no inconsistency in our statement, since we are not claiming our world as a whole to be static but merely mentally considering a static moment within it.

By the way, the arising of multiplicity does not only concern external objects; we must also take into consideration the Cartesian *cogito ergo sum*. This refers to the development of successive pluralities relating to the psyche, notably:

Cognized and cognizing, and also cognition; thus, Subject – consciousness – Object.

Self and other; or further, soul/spirit, mind, body and the rest of the world (the latter also spiritual, mental and material/physical).[142]

Everything beyond the totality of experience depends on *judgment*, the cognitive activity we characterize as rational. Such judgment exists in varying amounts in humans. It also seems to exist to a lesser degree in higher animals (since they search for food or look out for predators, for instances), and even perhaps a little in the lowest forms of sentient life (though the latter seem to function almost entirely by reflex).[143]

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142 The distinction between internal and external objects varies with context, of course. 'Internal' may refer to spiritual intuitions (own cognitions, own volitions, own appraisals, and self), mental phenomena (memories, mental projections, emotions), or bodily phenomena (sensations and visceral sentiments). 'External' then means, respectively, phenomena in one's own mind-body and beyond, or only those in one's body and beyond it, or again only the world outside one's body.

143 A good argument in favor of this thesis, that mental separation and negation are distinct stages of distinction, is the possibility it gives us (i.e. biology) of supposing that lower animals are aware of multiplicity but unable to negate (because the latter requires a more pronounced level of imagination).

32. CONTRARY TO HUME'S SKEPTICISM

Drawn from Logical and Spiritual Reflections (2008), Book I, Chapters 1-3.

1. Hume's "Problem of Induction"

In the present essay, I would like to make a number of comments regarding Hume's so-called problem of induction, or rather emphasize his many problems with induction. I am mindful of Hume in all my writings. In at least two places, I devote some attention to Hume's particular viewpoints[144]. If elsewhere I often do not mention him, or I just mention him in passing[145], as one proponent of this or that doctrine under discussion, it is because my emphasis is on proposing coherent theories rather than lingering on incoherent ones.

David Hume[146] is undoubtedly a challenging and influential philosopher. In his works, he repeatedly attacks many common concepts, such as the validity of induction (notably, generalization); the existence or knowability of natural necessity or law, causal connection or causation; and the existence or knowability of a self or person; that will is free of determinism and indeterminism; that an "ought" may be derived from an "is" or is a special kind of "is,"

These are of course essentially various facets of one and the same assault against common-sense, against human reason. I will briefly now reply to each of these skeptical objections. The central or root question here is, I believe, that of the validity of

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144 Namely, in *Phenomenology*, chapter II (section 5), and in *Ruminations*, part I, chapter 8 (sections 4-7).

145 See mentions in: *Future Logic*, chapters 65 and 67. *Phenomenology*, ch. I, V, VI and VII. *Judaic Logic*, ch. 2. *Buddhist Illogic*, ch. 7. *The Logic of Causation*, ch. 3, 10, 16 and app. 1. *Volition and Allied Causal Concepts*, ch. 2. *Ruminations*, part I, ch. 9, and part II, ch. 1, 6, 7. *Meditations*, ch. 32.

146 Scotland, 1711-76.

induction. For the other problems are solvable mostly by inductive means. So that if induction is invalid, it is indeed difficult to see how the various other basic ideas of reason could be justified.

With regard to Hume's problem with **generalization**: Hume[147] doubted the validity of generalization on the ground that *having in the past observed certain regularities is no guarantee that in the future such regularities will hold*. To appeal to a principle of Uniformity of Nature would, according to him, be a circular argument, since such a principle could only itself be known by generalization.

In Hume's view, a generalization is just a mental knee-jerk reaction by humans (and even animals, though they do it non-verbally), an expression of the expectation formed by repeated experiences of a similar kind, a sort of psychological instinct or habit rather than an epistemologically justifiable scientific methodology.

This might all seem credible, were we not to notice some glaring errors in Hume's understanding of generalization, and more broadly of induction[148].

Hume's error was to concentrate on the positive aspect of generalization and totally ignore the negative aspect of particularization.[149] Since he unconsciously equated inductive reasoning solely with generalization from past regularity, he naturally viewed the fact that some breach of regularity might indeed (as often happens) occur in the future as evidence that generalization *as such* is flawed. But this is just a misapprehension of the nature of induction on his part.

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147 In his *Treatise of Human Nature* (1739-40), and subsequent works. The *Treatise* is posted in full at http://socserv2.socsci.mcmaster.ca/~econ/ugcm/3ll3/hume/treatise1.html.

148 I here refer the reader to *Future Logic*, Part VI, for a fuller understanding of the issues. Read at least chapters 50 and 55.

149 This error has, I have read, already been spotted by Karl Popper.

He should have known better, since Francis Bacon had (some 80 years before, in his *Novum Organon*)[150], already clarified the all-importance of the "negative instance" as a check and balance against excessive generalization and in other forms of induction. Because Hume failed to grasp this crucial insight, we can say that his understanding of induction was fragmentary and inadequate.

All generalization is conditional; we may infer a generality from similar particulars, *provided we have sought for and not found evidence to the contrary*. To generalize to "All X are Y" we need to know two things, not just one: (a) that some X are Y, and (b) that no X to date seem not to be Y. Though the latter condition is usually left tacit, it is absolutely essential[151].

If we did find such contrary evidence early, before we generalized, we would simply not generalize. If we find it later, after we generalized, we are then logically required to particularize. Synthetic generalities are not meant as static absolutes, but as *the best available assumptions in the given context of knowledge*. Generalization is a dynamic process, closely allied with particularization; it is not a once and for all time process.

The same logic applies to other forms of induction[152], notably **adduction**. The latter refers to a broader concept of induction, from any evidence to any derived hypothesis (which may contain different terms than the evidence). The hypothesis is not merely confirmed by the evidence it explains, *but equally by the*

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150 England, 1561-1626. The full text (1620) is posted on the Internet at http://etext.library.adelaide.edu.au/b/bacon/francis/organon/complete.html.

151 Still today, many writers, philosophers and teachers fail to realize and mention this essential condition when they define or discuss generalization. It should nevermore be left tacit, to avoid the perpetuation of Hume's error.

152 Indeed, in the very act of concept formation, we do not merely *include* certain cases into it, but also (if only tacitly) *exclude* other cases from it. There is always both a positive and a negative aspect to thought, though the latter is often less manifest. Integration is always coupled with differentiation.

absence of contrary evidence and by the absence of better alternative hypotheses.

Note this well: the data that confirm a hypothesis do *not* suffice to make us believe it. The simple proof of this is that when a hypothesis is rejected for some reason, the data that in the past confirmed it *continue* to logically confirm it, yet the hypothesis is thrown out in spite of that. There are essential additional conditions, which make our inductive conclusion unassailable thus far, namely (to repeat) that we have to date no data that belies it and no more fitting hypothesis.[153]

Inductive truth is always frankly contextual. It is absurd to attack induction as "unreliable" because it does not yield truths as certain and foolproof as deduction is reputed to do. To argue thus is to claim that one has some standard of judgment other than (or over and above) the only one human beings can possibly have, which is induction.

When inductive logic tells us: "in the given context of knowledge, hypothesis X is your best bet, compared to hypotheses Y, Z, etc." – it is not leaving the matter open to an additional, more skeptical posture. For what is such **skepticism**, but itself just a claim to a logical insight and a material hypothesis?

If one examines skepticism towards induction, one sees it to be *nothing more than an attempted generalization from past occurrences of error (in other domains), one that pays no heed to past and present non-occurrences of error (in the domain under consideration)*. That is, it is itself a theory, open to inductive evaluation like any other.

Inductive logic has *already* taken that skeptical hypothesis into consideration and pronounced it inferior, because it does not duly take into consideration the specific current evidence in favor of X rather than all other alternatives.

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153 The logical calculus involved is thus not a simple dependence on "confirmation," but a much more complex and global set of considerations, including "non-rejection" and "competitiveness," See in this regard my detailed essay "Principles of Adduction" in *Phenomenology* (chapter VII, section 1).

Even if a scientific theory is not absolutely sure forevermore, we must stick by it if it seems at this time to be the closest to truth. The skeptic cannot come along and object that "closest is not close enough" – for that would mean he considers (nonsensically) that he has a theory that is closer than closest!

Hume foolishly ignored all this reasoning. He focused only on the positive aspect, and rightly complained that this could not possibly be regarded as logically final and binding! Under the circumstances, it is no wonder that he could see no "proof" of generalizing or adductive reasoning. If we wrongly define and fail to understand some process, it is bound to seem flawed to us.

When Hume discovered the unreliability of induction as he conceived it, he should have looked for a flaw in *his own view* of induction, and modified it, rather than consider induction as invalid. *That* would have been correct inductive behavior on his part. When one's theory leads to absurd consequences, our first reaction should be to modify our particular theory, not theorizing as such. Instead of doubting his own thinking, Hume attacked human knowledge in general, whining that it cannot be "proved,"[154]

But of course, logic – by that I mean deductive logic this time – cannot tolerate such self-contradiction. If someone claims the human means to knowledge, which includes induction as well as deduction, is flawed, then that person must be asked how come he arrived at this supposedly flawless proposition. One cannot reasonably have one's cake and eat it too.

The argument against generalization is itself a generalization, and so self-contradictory. We cannot say: since *some* generalizations are evidently erroneous, therefore *all* generalization is invalid (i.e. we cannot be sure of the validity of any generalization, which makes it as good as invalid) – because, of course, this argument is itself a generalization, and therefore is invalidated by itself! What we can say for sure is that a

154 Hume's egotistical thinking in this and many other matters was very similar to that of certain philosophers much earlier in India (notably the Buddhist Nagarjuna). Not to mention Greek sophistries.

generalization (like that one) that leads to a contradiction is deductively invalid.

When one discovers a contradiction in one's thinking, it is not logic as such that is put in doubt but only one's current thinking. It is silly to cling to a particular thought and reject logic instead. Hume had greater faith in his particular logical notions (which were not, it turns out very logical) than he had in logic as such. The true scientist remains humble and open to correction.

Our ideas and theories have to be, as Karl Popper put it, *not only verifiable but also falsifiable*, to be credible and trustworthy. Albert Einstein likewise remarked[155]:

> *"The belief in an external world independent of the perceiving subject is the basis of all natural science. Since, however, sense perception only gives information of this external world or of "physical reality" indirectly, we can only grasp the latter by speculative means. It follows from this that our notions of physical reality can never be final. We must always be ready to change these notions – that is to say, the axiomatic basis of physics – in order to do justice to perceived facts in the most perfect way logically."*

If one examines Hume's actual discourse in his books, one sees that even as he explicitly denies the reliability of induction he is implicitly using induction to the best of his ability. That is, he appeals to facts and logic, he conceptualizes, generalizes and proposes theories, he compares his favored theories to other possible interpretations or explanations, he gives reasons (observations and arguments) for preferring his theories, and so forth. All that is – induction. Thus, the very methodology he rejects is the one he uses (albeit imperfectly) – and that is bound to be the case, for human beings have no other possible methodology.

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155 I cannot say just where – having gleaned this quotation out of context somewhere in the Internet.

To say this would seem to suggest that self-contradiction is feasible. Not so, if one considers how the two aspects, viz. the theory and the practice, may be at odds in the same person. When Hume says that induction is unreliable, he of course means that induction *as he sees it* is unreliable; but he does not realize that *he sees it incorrectly*[156], i.e. that a *quid pro quo* is involved. Indeed, he does not seemingly realize that the way he views it *affects* the way he gets his views of it, i.e. that he misleads himself too.

While he consciously denies the validity of induction, he unconsciously and subconsciously naturally continues to use it. However, because he has (prejudicially) chosen to deny induction in principle, he cannot study it as openly, impartially and thoroughly as he would otherwise have done, and he is led into error both in his understanding of it and in his actual use of it. Bad theory generates bad practice. And the converse is of course also true, wrong practices promote wrong theories. He is trapped in a vicious circle, which requires a special effort of objectivity to shake off.

We must always keep in mind that what seems impossible or necessary to a philosopher (or anyone else, for that matter) depends on how he views things more broadly. Every philosopher functions within the framework of some basic beliefs and choices. These are not an eternal prison, but they take time and effort to overcome. Sooner or later, a philosopher gets locked-in by his past commitments, unless he takes great pains to remain open and inquisitive.

2. The Principle of Induction

Concerning the uniformity principle, which Hume denies, it is admittedly an idea difficult to uphold, in the sense that we cannot readily define uniformity or make a generality of it. We might speak of repetition, of two or more particular things seeming the

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156 Or at least, incompletely – being for instance aware of the positive side (e.g. apparent constancy), but unaware of the negative side (e.g. testing for inconstancy).

same to us; but we are well aware that such regularity does not go on ad infinitum. On the contrary, we well know that sooner or later, something is bound to be different from the preceding things, since the world facing us is one of multiplicity.

Therefore, this "principle" may only be regarded as a heuristic idea, a rule of thumb, a broad but vague practical guideline to reasoning. It makes no specific claims in any given case. It just reminds us that there are (or seem to us to be) 'similarities' in this world of matter, mind and spirit. It is not intended to deny that there are also (apparent) 'dissimilarities'. It is obviously not a claim that all is one and the same, a denial of multiplicity and diversity (in the world of appearances, at least[157]). To speak of uniformity in Nature is not to imply uniformity of Nature.

We might also ask – can there be a world *without any* 'uniformities'? A world of universal difference, with no two things the same in any respect whatever is unthinkable. Why? Because to so characterize the world would itself be an appeal to uniformity. A uniformly non-uniform world is a contradiction in terms. Therefore, we must admit *some* uniformity to exist in the world. The world need not be uniform throughout, for the principle of uniformity to apply. It suffices that some uniformity occurs.

Given this degree of uniformity, however small, we logically can and must talk about generalization and particularization. There happens to be some 'uniformities'; therefore, we have to take them into consideration in our construction of knowledge. The principle of uniformity is thus not a wacky notion, as Hume seems to imply. It is just a first attempt by philosophers to explain induction; a first try, but certainly not the last. After that comes detailed formal treatment of the topic. This proceeds with reference to specifics, symbolized by X's and Y's, and to strict logic.

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157 I.e. such recognition of pluralism does not at the outset exclude monism. The former may be true at the superficial phenomenological level, while the latter reigns at the metaphysical level of ultimate reality.

The uniformity principle is not a generalization of generalization; it is not a statement guilty of circularity, as some critics contend. So, what is it? Simply this: ***when we come upon some uniformity in our experience or thought, we may readily assume that uniformity to continue onward until and unless we find some evidence or reason that sets a limit to it***. Why? Because in such case the assumption of uniformity already has a basis, whereas the contrary assumption of difference has not or not yet been found to have any. The generalization has some justification; whereas the particularization has none at all, it is an arbitrary assertion.

It cannot be argued that we may equally assume the contrary assumption (i.e. the proposed particularization) on the basis that in past events of induction other contrary assumptions have turned out to be true (i.e. for which experiences or reasons have indeed been adduced) – for the simple reason that such a generalization from diverse past inductions is formally excluded by the fact that we know of many cases that have not been found worthy of particularization to date.

That is to say, if we have looked for something and not found it, it seems more reasonable to assume that it does not exist than to assume that it does nevertheless exist. Admittedly, in many cases, the facts later belie such assumption of continuity; but these cases are relatively few in comparison. The probability is on the side of caution.

In any event, such caution is not inflexible, since we do say "until and unless" some evidence or argument to the contrary is adduced. This cautious phrase "until and unless" is of course essential to understanding induction. It means: until *if ever* – i.e. it does not imply that the contrary will necessarily occur, and it does not exclude that it may well eventually occur. It is an expression of open-mindedness, of wholesome receptiveness in the face of reality, of ever readiness to dynamically adapt one's belief to facts.

In this way, our beliefs may at all times be said to be as close to the facts as we can get them. If we follow such sober inductive logic, devoid of irrational acts, we can be confident to have the best available conclusions in the present context of knowledge.

We generalize when the facts allow it, and particularize when the facts necessitate it. We do not particularize out of context, or generalize against the evidence or when this would give rise to contradictions.

Hume doubted the validity of generalization because he thought that we adopt a general proposition like All X are Y, *only* on the basis of the corresponding particular Some X are Y. But if the latter was *sufficient* to (inductively) establish the former, then when we were faced with a contingency like Some X are Y and some X are not Y, we would be allowed to generalize both the positive and negative particulars, and we would find ourselves with a contradiction[158] in our knowledge, viz. with both All X are Y and No X are Y.

But since contradiction is error, according to the 2nd law of thought, it follows that a particular is not by itself enough to confirm a generality. To do so, we need also to first adduce that the opposite particular is not currently justified. Note well what we have shown here: this criterion for generalization follows from the law of non-contradiction. Hume and his skeptical successors did not take this additional criterion into account. They noticed the aspect of 'confirmation', but ignored that of 'non-rejection'.

The uniformity principle ought to be viewed as an application of a much larger and important principle, which we may simply call ***the principle of induction*** (in opposition to the so-called problem of induction). This all-important principle could be formulated as follows: ***given any appearance, we may take it to be real, until and unless it is found to be illusory***.[159]

This is the fundamental principle of inductive logic, from which all others derive both their form and their content. And indeed, this is the way all human beings function in practice (with the rare exception of some people, like Hume, who want to seem

158 Or more precisely a contrariety.

159 I have formulated and stressed this principle since I started writing logic, although I here name it "principle of induction" for the first time. See, for instances: *Future Logic*, chapter 2, etc.; *Phenomenology*, chapter 1, etc.; *Ruminations*, chapters 1 and 2.

cleverer than their peers). It is, together with Aristotle's three laws of thought, the supreme principle of methodology, for both ordinary and scientific thought, whatever the domain under investigation[160].

Indeed, we could construe this principle of induction as ***the fourth law of thought***. Just as the three laws proposed by Aristotle are really three facets of one and the same law, so also this fourth law should be viewed as implicit in the other three. Induction being the most pragmatic aspect of logic, this principle is the most practical of the foundations of rational discourse.

The principle of induction is a phenomenological truth, because it does not presume at the outset that the givens of appearance are real or illusory, material or mental, full or empty, or what have you. It is a perfectly neutral principle, without prejudice as to the eventual content of experience and rational knowledge. It is not a particular worldview, not an *a priori* assumption of content for knowledge.

However, in a second phase, upon reflection, the same principle favors the option of reality over that of illusion as a working hypothesis. This inbuilt bias is not only useful, but moreover (and that is very important for skeptics to realize) logically rock solid, as the following reasoning clearly shows:

This principle is self-evident, because its denial is self-contradictory. If someone says that *all appearance is illusory, i.e. not real*, which means that all our alleged knowledge is false, and not true, that person is laying claim to some knowledge of reality (viz. the knowledge that all is unreal, unknowable) – and thus contradicting himself. It follows that we can only be

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160 I stress that here, to forestall any attempt to split ordinary and scientific thought apart. We should always stress their continuity. The difference between them is (theoretically, at least) only one of rigor, i.e. of effort to ensure maximal adherence to logic and fact. This only means, at most, that more ordinary people fail to look carefully and think straight than do most scientists – but both groups are human. Another important thing to stress is that this method is the same for knowledge of matter or mind, of earthly issues or metaphysical ones, and so forth. The principle is the same, whatever the content.

consistent by admitting that we are indeed capable of knowing some things (which does not mean everything).

It follows that the initial logical neutrality of appearance must be reinterpreted as in all cases an initial reality *that may be demoted* to the status of illusion if (and only if) specific reasons justify it. Reality is the default characterization, which is sometimes found illusory. Knowledge is essentially realistic, though in exceptional cases it is found to be unrealistic. Such occasional discoveries of error are also knowledge, note well; they are not over and above it.

If we did not adopt this position, that appearance is biased towards reality rather than illusion, we would be stuck in an inextricable agnosticism. Everything would be "*maybe real, maybe illusory*" without a way out. But such a problematic posture is itself a claim of knowledge, just like the claim that all is illusory, and so self-inconsistent too. It follows that the interpretation of appearance as reality until and unless otherwise proved is *the only* plausible alternative.[161]

If appearance were not, *ab initio* at least, admitted as reality rather than as illusion or as problematic, we would be denying it or putting it in doubt without cause – and yet we would be granting this causeless denial or doubt the status of a primary truth that does not need to be justified. This would be an arbitrary and self-contradictory posture – an imposture posing as logical insight. All discourse *must* begin with some granted truth – and in that case, the most credible and consistent truth is the assumption of appearance as reality unless or until otherwise proved.

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161 Worth also stressing here is the importance of working hypotheses as engines of active knowledge development. A skeptical or agnostic posture is essentially static and passive; taken seriously, it arrests all further development. Scientists repeatedly report the crucial role played by their working hypothesis, how it helped them to search for new data that would either confirm or refute it, how it told them what to look for and where and how to look (see for instance, Gould, p. 172). This is true not only of grand scientific theories, but of ordinary everyday concepts.

We may well later, *ad terminatio* (in the last analysis), conclude that our assumption that this appearance was real was erroneous, and reclassify it as illusory. This happens occasionally, when we come across conflicts between appearances (or our interpretations of them). In such cases, we have to review in detail the basis for each of the conflicting theses and then decide which of them is the most credible (in accord with numerous principles of adduction).

It should be stressed that this stage of reconciliation between conflicting appearances is not a consequence of adopting reality as the default value of appearances. It would occur even if we insisted on neutral appearances and refused all working hypotheses. Conflicts would still appear, and we would still have to solve the problem they pose. In any case, never forget, the assumption of reality rather than illusion only occurs when and for so long as no contradiction results. Otherwise, contradictions would arise very frequently.

> Note well that I do not understand appearance in quite the same way Edmund Husserl does, as something *ab initio* and intrinsically mental; such a view is closer to Hume or even Berkeley than to me.
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> The ground floor of Husserl's phenomenology and mine differ in the primacy accorded to the concepts of consciousness and of the subject of consciousness. My own approach tries to be maximally neutral, in that appearances are initially taken as just 'what appears', without immediately judging them as 'contents of someone's consciousness'. Whereas, in Husserl's approach, the wider context of appearance is from the start considered as part and parcel of the appearance.
>
> For me, some content comes first, and *only thereafter* do we, by a deduction or by an inductive inference, or perhaps more precisely by an intuition (an additional, secondary, reflexive act of consciousness), become aware of the context of consciousness and conscious subject. At this later stage, we go back and label the appearance as a "content of" consciousness, i.e. as something whose apparition (though not whose

> existence) is made possible by an act of consciousness by some subject. Content is chronologically primary; the context is secondary.
>
> Whereas in Husserl's philosophy, the fact of consciousness and its subject are present from the start, as soon as the appearance appears. Husserl's mistake, in my view, is to confuse logical order and chronological order, or ontological and epistemological. Of course, logically and ontologically, appearance implies consciousness and someone being conscious; but chronologically and epistemologically, they occur in succession.
>
> As a result of this difference, his approach has a more subjectivist flavor than mine, and mine has a more objectivist flavor than his. Note, however, that in his later work Husserl tried more and more to shift from implied subjectivism to explicit objectivism.

We have seen the logic of induction in the special case of generalization. Given the positive particular 'Some X are Y' (appearance), we may generalize to the corresponding generality 'All X are Y' (reality), *provided* we have no evidence that 'Some X are not Y' (no conflicting appearance). Without this caveat, many contradictions would arise (by generalizing contingencies into contrary generalities); that proves the validity of the caveat. If (as sometimes occurs) conflicting evidence is eventually found (i.e. it happens that Some X are not Y), then what was previously classed as real (viz. All X are Y) becomes classed as illusory (this is called particularization).

Induction is a flexible response to changing data, an ongoing effort of intelligent adaptation to apparent facts. Few logicians and philosophers realize, or take into consideration, the fact that one of the main disciplines of inductive logic is **harmonization**. They discuss observation and experiment, generalization and adduction, and deduction, with varying insight and skill, but the logic of resolving contradictions occasionally arrived at by those other inductive means is virtually unknown to them, or at least very little discussed or studied. This ignorance of, or blindness

to, a crucial component of induction has led to many foolish theories[162].

Notice well, to repeat, the *conditional form* of the principle of induction: it grants credibility to initial appearances "until and unless" contrary appearances arise, which belie such immediate assumption. Thus, in the case of the narrower uniformity principle, the initial appearance is the known few cases of similarity (or confirmation) and the fact of not having to date found cases of dissimilarity (or conflicting data); this allows generalization (or more broadly, theory adoption) until if ever we have reason or evidence to reverse our judgment and particularize (or reject, or at least modify, the theory).

The principle of induction may likewise be used to validate our reliance on intuition and sensory and inner perception, as well as on conception. It may also be applied to causality, if we loosely formulate it as: order may be assumed to exist everywhere, until and unless disorder appears obvious. However, the latter principle is not really necessary to explain causality, because we can better do that by means of regularity, i.e. with reference to the uniformity principle, i.e. to generalization and adduction.

In any case, the principle of induction is clearly a *phenomenological* principle, before it becomes an epistemological or ontological one. It is a logical procedure applicable to *appearance as such*, free of or prior to any pretensions to knowledge of reality devoid of all illusion. The claims it makes are as minimal as could be; they are purely procedural. It is for this reason as universal and indubitable as any principle can ever be.

Moreover, the principle of induction (and likewise its corollary the uniformity principle) applies equally to the material, mental and spiritual realms. It is a valid method of dealing with data, independently of the sort of data involved, i.e. irrespective of the 'substance' of the data. Many people associate induction exclusively with the physical sciences, but this is misconceived.

162 For example, Hempel's so-called paradox of confirmation.

Inductive logic sets standards of judgment applicable in all fields – including in psychology and in moral and spiritual concerns.

3. Causation, Necessity and Connection

One of the main battlegrounds of Hume's attack on induction is his treatment of **causation**. This is no accident, since one of the most important functions of induction is to find and establish causal relations. If we now turn our attention to this issue, we find almost exactly the same error on Hume's part.

He defines causation as "constant conjunction," ignoring the equally important inverse (*a contrario*) aspect of it. In truth, causation (in its strongest determination) of Y by X would be defined as follows: "X is always accompanied or followed by Y" (the positive aspect), *and* "not X is always accompanied or followed by not Y" (the negative aspect).

The constant conjunction of *the presences* of X and Y would not by itself convince us there is causation between them; we would also have to find that *the absences* of X and Y are likewise related. This is at least true in the strongest determination of causation, known as complete and necessary causation. There are in truth lesser determinations, but these similarly include both a positive and a negative side, so the argument holds for them too[163].

To define causation, as Hume did, only with reference to the positive aspect of it, would necessarily make the bond involved seem flimsier. The negative aspect is what gives the positive aspect its full force. The coin is two-sided. If one focuses only on the complete causation and ignores the underlying necessary causation, it is no wonder that one (like Hume) sees no "necessity" in causation.[164]

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163 As I show in great detail in my work *The Logic of Causation.*

164 Indeed, if one or both of the things labeled X and Y is/are categorically constant, the constant conjunction of X and Y is formally true even though the two things are independent of each other. For the constancy to be applicable specifically to the conjunction of X and Y, there must be inconstancy in opposite circumstances.

The idea of causation thus involves not just one but two generalizations, viz. a seemingly constant conjunction between X and Y, *and* a seemingly constant conjunction between the negation of X and the negation of Y. Note this well, one cannot refer to "constant conjunction" without admitting generalization.

And one cannot refer to causation without considering both the presences and the absences of the putative cause and effect. I say 'putative' because it is not right to call the two events or things concerned a cause and an effect till they have been formally established to be so[165]. A cause is generally understood to be something that *makes a difference to*, i.e. has an effect on, something else. If something has no effect on anything it cannot rightly be called a cause.

Another way to express this is to point out that "constant conjunction" is a very ambiguous term, because it does not specify direction. At first sight, it means that the cause (X) is always followed (or accompanied) by the effect (Y) – i.e. 'if X, then Y," But upon reflection, it also might refer to the reverse direction, viz. that the effect always implies (or presupposes) the cause – i.e. "if Y, then X," And in the last analysis, the correct understanding (for the strongest form of causation) is that both those directions should be intended – for that would ensure the above-mentioned double condition of causation; i.e. that the relation have both a positive and negative side (since "if Y, then X" can be contraposed to "if not-X, then not-Y).

"Constant conjunction" would be a correct description of (complete necessary) causation, only if the expression were understood in this double manner. The vagueness of the phrase makes it possible for Hume to treat it as if it only meant "every occurrence of C has an occurrence of E attached to it" – while at the same time the phrase subconsciously impinges on us as meaning a two-way constancy of conjunction, i.e. as including "every occurrence of E has an occurrence of C attached to it,"

165 Many fake arguments against causation are based on naming the items under consideration cause and effect before they have been demonstrated to be so.

Because of this theft of tacit meaning, many of Hume's skeptical statements about causation seem superficially credible when they are not in fact so.

As a result of the vagueness of his treatment, Hume seemingly considered only complete causes to be causes – and simply did not take into consideration partial causes. Moreover, he seems to have totally ignored necessary and contingent causation. These suspicions are suggested by his definition of causation as 'constant conjunction'. Such a definition fails to take into account partial causes on the positive side, and necessary and contingent causes on the negative side. It covers just one corner of the domain of causation. (And of course, as we shall see later, it also ignores indeterministic causality, i.e. volition.)

Hume, furthermore, argues that generality of conjunction is not the same as **necessity**. If two things *are* constantly conjoined, it does not mean that they *must be* so. This is true, but to raise this as an objection is to fail to realize the exact logical relation between the actual modality (are) and necessity (must be). They are two *modal categories*, and their relation is simply this: that necessity is *more general than* actuality, just as actuality is more general than possibility.

That is to say: to affirm the 'necessity' of some relation is to engage in a larger generalization than to affirm its 'general' actuality. It follows that if one admits the meaningfulness and validity for a general actual conjunction, one must equally admit them for the more pronounced necessary conjunction. If generalization can go so far, it can in principle go farther still. To accept the one without the other, just because necessity is more abstract (higher up the modal scale) than general actuality, would be arbitrary. There is no logical basis to be choosy like Hume.

Indeed, when Hume denies the possibility of human knowledge of necessity (admitting at best generality, if that), what is he doing in fact other than claiming for himself a necessity? After all, impossibility (i.e. negation of possibility) is simply the negative form of necessity (i.e. it is necessity of negation). Therefore, Hume is here again in a position of inextricable self-contradiction.

Additionally, it is logically impossible to deny the concept of necessity while admitting that of possibility. The moment one admits some things as possible (as their actuality logically implies them to be), one must equally admit some others are impossible. That is, there are limits to all possibilities. If everything were only possible, nothing at all would be possible for contradictories would have to intertwine. Thus, denying all necessity is a logically untenable position.

There is yet another way that Hume's skeptical approach to causation relates to his problem with induction. He repeatedly asks on what basis we believe in a causal "**connection**," According to him, all we observe and can observe are the happenstances of conjunction; *we never observe and can never observe any link or tie between the things conjoined*.

Connection is not an observable fact that we can generalize from, even granting generalization to be valid. Causation is at best, he implies, a generalization about conjunction – but it tells us nothing of a stronger underlying bond, which is really what we popularly understand by causation. The idea of connection is thus an after-the-fact projection of some obscure force unto an essentially statistical report; it assumes something more than what is empirically given.

In reply, we should first point out that 'conjunction' is not a concrete object, but an abstraction. Phenomenologically, it refers to the appearance of two objects side-by-side in some context. The term does not refer to a phenomenon, something with sensible qualities in itself – it refers rather to a relation between phenomena (or, similarly, other appearances or concepts) that we project to unify them for our rational purposes. It is a tool of ratiocination.

'Connection' is also an abstract term. We might therefore ask how come Hume acknowledges conjunction but not connection. The answer would be that the latter is a more complex abstraction than the former. Connection is not as immediately related to observation as conjunction. More imagination is needed to grasp it, because it refers to collective rather than to individual properties of things.

It is true, as Hume implies, that causation (i.e. deterministic causality, as distinct from volition) is never known or knowable in individual cases, except through knowledge of the behavior of kinds of things. Therefore, causation cannot be generalization of perceived individual connections, but only generalization from individual conjunctions. Connection is a rational, top-down idea, more than an empirical, bottom-up idea. It is imagined with reference to many observations, rather than simply observed.

Even though Hume correctly realized this, his objection to connection has no weight, because according to inductive logic (viz. the principles of adduction), we can imagine any thing we choose as a hypothesis, and affirm it as true, provided and so long as it remains compatible with all experience (on both the positive and negative sides), meaningful, consistent with itself and all other empirical and abstract knowledge, and more coherent, relevant[166] and credible than all alternative hypotheses.

In other words, what Hume is here refusing to comprehend is that most human knowledge is based on abstraction and imagination. He fails to understand that this is quite legitimate, provided it is properly regulated by the rules of adduction. Generalization directly from experience is just one kind of induction, the simplest. More broadly, we have the process of adduction, i.e. of forming fancy or complex hypotheses and testing them repeatedly both experientially and rationally.

The idea of causal connection (or tie or link or bond) is just one such hypothesis. It is indeed not a direct generalization from experience like "constant conjunction," but is a quite legitimate and ordinary adduction from experience. It is a rational construct we find useful for our understanding, both consistent with all evidence we have from experience and internally consistent.

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166 Relevance here refers to there being more than only compatibility between the thesis and empirical data; for the thesis to be relevant to the data at hand, it must imply some of them and thus conversely be fortified by them. The thesis is thus useful, in somewhat explaining the data. And it must be more useful than others, for if it is only as useful and sound as its alternative(s), it remains problematic (i.e. we cannot decide between them all).

That is, the genesis of the concept of connection accords with the scientific method.

A common objection is: "night follows day and day follows night, but we do not say that day causes night or vice versa," Indeed, more generally, every impermanent thing is sure to be followed sooner or later by its negation; but we do not consider such sequences of events as consequential. Sequence is not always consequence. Hence, causation is something more to us than mere repeated togetherness. We need a concept of connection, over and above that of mere constant conjunction, to be able to express this important thought. No tautology is involved.

We could further suggest that "connection" is not commonly thought of as something general, the same abstract ingredient in all particular cases of causation. In practice, something specific and relatively concrete is in each case identified as the operative connection. A more precise analysis is required in each case, to determine where the connection lies. For instance, in the case of day and night, the common ingredient is that of the sunshine and earthly rotation, with some exceptions during eclipses due to the moon.

Thus, the phenomena of day and night may be said to be due to the operation of common causatives. Their constant conjunction is due to them both being alternative effects of certain other phenomena. They must succeed each other, because they cannot occur at the same time. Under certain circumstances, the one occurs; under the remaining circumstances, the other occurs. Sun plus earth facing this way and moon in that position gives day; the same with earth facing the other way gives night; and so on.

We may generalize this example by saying that we should regard constant conjunction as only a first *indicator* of causation. It is indicative of causation in most instances, as the initial default categorization. But in some instances, we must admit that the conjoined phenomena succeed each other due to some third factor (or collection of factors), with which they are indeed both in turn constantly conjoined. They have some common cause(s),

or constant conjunct(s), which more precisely explain their surprising regularity of succession.

In such cases, we would not call the two phenomena 'directly' causally connected (even though they invariably alternate). We would, however, instead consider each of them as indeed directly causally connected to the third phenomenon (or set of phenomena)[167]. Thus, our idea of causal connection is a subcategory of constant conjunction, rather than a mysterious universal additive to it. For this reason, we need two distinct concepts.

If we take the trouble to analyze Hume's own discourse, we are sure to find thousands of concepts and beliefs in it *as abstract as* that of causal connection that he so derides[168]. His will to attack this particular abstraction is just an arbitrary refusal to give credence to perfectly rational arguments. He gives no evidence or solid reason to show us that this concept is more tenuous than any of those he himself accepts. We must not condone such double standards.

Generalization and adduction are equally justified, and logically not very different processes. Indeed, each could be viewed as a special case of the other. One cannot admit the one and reject the other. One cannot more or less admit the one, and more or less reject the other. They are essentially the same. Both are *indispensable and inescapable* means of human knowledge, which is mostly conceptual and theoretical. No one can claim to rationally criticize them without using them.

The likes of Hume have this fastidious dissatisfaction with the inherent tentativeness and uncertainty of induced knowledge, because their narrow minds are firmly set on the notion that only deduction yields "proof," Nothing could be further from the

167 We can then also say that the two phenomena are 'indirectly' causally connected *through or by* the third phenomenon.

168 To name just one: the notion of "association" of ideas. What is the concrete content of this abstract term? Has "association" a sensible quality, like a color, tune, smell, taste or feel? Clearly not – yet Hume freely uses this abstraction. Indeed, it is to him the main force (another abstraction) in the mechanics of ideas that he wishes to institute for psychology, emulating Isaac Newton's treatment of physics.

truth. Most or all apparently deduced truths depend to some extent on induction from experience. Deduction is just one tool among others in the essentially inductive enterprise of human knowledge. Even the fanatic empiricist cannot formulate any idea without using induction.

The validity (as well as need) of induction is equal to that of deduction. Deduction is not somehow superior to induction. The validation of deduction (i.e. the science of deductive logic, including the laws of thought) depends on a host of inductions. The validation of induction depends on a host of inductions, too. In either case, we rely on our *logical insights*, on what seems or does not seem logical and credible, as well as on a mass of information.

Skeptics cannot refuse such logical insights without appealing to this very same faculty in us. When a skeptic says that this or that idea or belief is or is not logical, or credible, or reliable, or convincing, or provable, or valid, or anything or the sort, he is claiming a logical insight and asking us to have the same logical insight. We may agree or disagree. He cannot in any case claim to function over and above logical insight. He is not superhuman, graced with special privileges.

33. MORE REFLECTIONS ON INDUCTION

Drawn from Logical and Spiritual Reflections (2008), Book I, Chapters 4,10b,12,13:1-2.

1. The Psychology of Induction

Hume tried his best to do away with the science of induction by psychologizing our understanding of it. Of course, there is a psychology of induction, since humans have a psyche and induce. But Hume attempted to reduce induction to psychological mechanisms, i.e. to substitute a psychology of inductive thought for the logic of inductive thought. He proposed a description that effectively eliminated the possibility of evaluation and prescription. He sought to permanently undercut all attempts to validate induction.

With this goal in mind, Hume proposed a psychological theory of **generalization**. Generalization was to him a mere quasi-mechanical or instinctive reaction of expectation due to repeated imprints in the mind; it was, effectively, an acquired habit. Essentially, Hume was arguing that the repeated experience of cases of X that are Y drives us to conclude that all X are Y (i.e. to expect that yet unseen cases will conform to past experience), even though in principle things might well (and often do) turn out otherwise.

But according to inductive logic, Hume's theory is just a hypothesis that has to, itself (like all hypotheses), be confirmed repeatedly and never infirmed. Hume cannot regard it as somehow exempt from or transcending inductive logic. It is subsumed by it like any other theory. In fact, there is no psychological drive such as Hume projects – and his theory is itself proof of that, since he himself is aware that things might (and often do) turn out differently than expected.

It is important to notice that, in practice, while we do frequently generalize, we often do so tentatively fully aware that we might

have reason to change our minds later on. Moreover, we often abstain from generalizing, because we do not want to proceed hastily or because we are already aware of contrary evidence. Also, we often particularize after having generalized, due to coming across new evidence to the contrary.

It follows from such simple considerations that *Hume's claim to a psychological law is empirically inaccurate*. It is a false observation, an overly hasty generalization from limited or selective introspection. Not only does it not explain the phenomenon of generalization, nor replace the need for a logical and epistemological treatment of the issue, it is an erroneous psychological claim, incorrect psychology.

Another attempt at reductive psychologizing was Hume's attempt to write-off causation as mere **association of ideas**. Basically, this suggests, Hume had personal difficulty distinguishing the fact of causation from our way to knowledge of causation; because he confused the two issues, he tried to conflate them.

Underlying Hume's notion of association of ideas was of course his belief that what we perceive (when we seem to perceive the world) are not things in the world out there but images of such things produced in the mind through sensations. Due to this erroneous (because internally inconsistent, self-contradictory) analysis of the experiential process, he seems (in some people's eyes) to have some credibility in affirming causation as mere association of ideas.

For Hume effectively adopted John Locke's theory of human knowledge as his starting point. This theory admittedly seems like common-sense: we have senses and they obviously somehow produce images and memories in us. However, this is the basis of the worldview that has come to be called Naïve Realism (or uncritical materialism). It seems reasonable, but upon reflection it is found to be wobbly.

If the senses truly produce images in our minds of the world beyond them, it follows that we have no direct knowledge of the world out there at all, but only knowledge of the said images (this term here intends all phenomenal modalities, i.e. not only sights, but also sounds, smells, tastes, and various touch

sensations). In that case, how do we know of the bodily senses at all, and on what basis could we at all affirm a world beyond them? It is a seemingly inextricable dilemma.

At first glance, to affirm that our cognitive relation to the world out there is mediated by ideas seems innocuous. It seems obvious enough that our ideas, or most of them, somehow 'represent' or 'correspond to' the world. But upon reflection, such a view of how our knowledge is constituted and justified is logically untenable. How can we claim our ideas representative or correspondent to reality if we have no immediate contact with it by which to make this judgment? How indeed can we even claim our ideas *not to* represent or correspond to reality? We are seemingly doomed to utter ignorance.

To his credit, Hume (unlike Locke[169]) became aware of the insuperable difficulty that the common-sense theory of knowledge raised. Less to his credit, Hume derived a deep skepticism from this puzzle, because he effectively assumed there was no other approach. That is, rather than considering Locke's particular theoretical approach to have caused the dilemma, he viewed the problem as a definitive cause for doubting all human knowledge as such.

That such a radical doubt in turn cast doubt on his own faculty of knowledge and conclusions apparently did not cross Hume's mind (or not sufficiently). For, though henceforth fundamentally a skeptic, he continued seeking and claiming knowledge. But he did not try very hard to find a solution to the inherent problem. He never discovered the solution made possible by a phenomenological approach.[170]

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169 I am stereotyping things a bit, because in truth Locke was somewhat aware of the problem, and so was Berkeley after him (and before Hume). Perhaps the philosopher most to blame should be Descartes. But I cannot here get into the fine details of history.

170 This has come much later in the history of philosophy. Even Immanuel Kant, Hume's intellectual successor, never grasped phenomenology, but instead produced a complicated system of philosophy that increased the appearance-reality chasm. Note that when I use this term, I do not necessarily mean the Hegelian or

This approach is encapsulated by the aforementioned *principle of induction*, which starts the enterprise of knowledge with regard to appearances rather than to sense perceptions. ‘Appearances’ refers to the contents of consciousness irrespective of their source, so this term does not have presuppositions like ‘sense perceptions’. It is not a verbal issue, but one of ordering of knowledge, note well. In a phenomenological perspective, Locke’s theory regarding sensations and ideas is just that – one attempted explanation of certain appearances. Seen in this light, the difficulties it presents seem far less threatening.[171]

Now, all this is said here only to explain why Hume was more or less bound to opt for a reduction of causation to ‘association of ideas’. Since his viewpoint effectively *divorced* ideas from their objects, he could not talk about the objects themselves without some nagging discomfort, and he was pretty well cornered into rather discussing ideas.

But it must be stressed that for us, who are free of the dilemma posed by Locke’s theory thanks to a more phenomenological approach, the scenery looks very different. We can logically distinguish ideas from the objects they intend – be these objects physical, mental or spiritual. Although ideas might conceivably always appear in certain sequences, this is not for us sufficient reason to declare the objects they intend to be causally related.

Here again, we must apply deductive and inductive standards to judge the issue.

For a start, it is worth pointing out that the concept of association of ideas is inherently one of causation. Leaving aside Hume’s view of causation as mere constant conjunction as against connection, to say that ideas are associated in some way is to claim a connection of some sort between them. If we think in terms of one idea ‘giving rise to’ another, or we use any other

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Husserlian attempts at phenomenology, though these two later philosophers certainly played important roles.

171 The reader is referred to my work on phenomenology for more on this topic.

such expression, we are thinking causation. The implication may be tacit, but it is clearly there.

That the causal sequence concerns the specific kind of thing we call ideas, rather than the kind of thing we call objects, is irrelevant to the relation itself, which is conceived as technically the same irrespective of the kind of thing related. Causation is a certain kind of relation between terms or theses, which has nothing to do with their actual contents.

To say that the idea of X causes the idea of Y is as much a claim to causation as to say that X causes Y. The formal proof is that we can call "the idea of X" a special case of X, and "the idea of Y" a special case of Y. In formal logic, X and Y are symbols for any two terms; they are not reserved for objects as against ideas. For this reason, the principles developed with regard to X and Y are universal.

If we formally admit a causative relation between ideas (or impressions, sensations, concepts, beliefs, thoughts, or any such mental phenomena), there is no reason for us not to admit a causative relation between other kinds of things (i.e. between non-ideas, viz. the objects of most ideas). To accept the one and refuse the other, as Hume does, can only be arbitrary, for there is nothing to formally distinguish the two. The variables differ, but the underlying relation between them is the same.

In short, our use of the word association in one case and causation in the other is a mere verbal embellishment. Hume's main argument is thus based on a superficial verbal distinction. And here again, his attempt to substitute psychology for logic is implausible. The truths of logic are independent of any psychological thesis.

Secondly, Hume is incoherent when he formulates a concept of association of ideas that is meant *to exclude* a concept of causation between the objects the ideas refer to. Such an exclusive contrast between the two concepts commits the stolen concept fallacy. For to invalidate the association of ideas, i.e. to point out that ideas may be erroneously associated, we need to have a more objective knowledge to compare to. It is logically impossible to claim associations of ideas to be occasionally or

inherently wrong, without claiming separate knowledge of the true causation between the objects concerned.

In the very act of downplaying or denying causation between objects by positing association of ideas, Hume is relying on his and our past experience that sometimes associations do not match causations. If we had no such past experiences, we could not comprehend Hume's argument, or be convinced by it. Hume's discourse tacitly implies his and our ability to grasp causation independently of association, i.e. that we all have access to some objective reality.[172]

Hume is here committing the same silly error Kant would later commit when claiming that things as they really are ("in themselves") are radically different from things as they appear. How could *he* know it? No one can consistently postulate a conflict between reality and appearance without having access to both. If someone accuses humans of total delusion, he forfeits all logical right to discuss the presumed 'real' world, for all such discussion (even hypothetically) would be self-contradictory, since it is itself a claim to some knowledge.

The critic cannot claim to be an exception to the general rule he posits. We cannot project a scenario that excludes us – but some people keep trying to! We admittedly all have some illusions sometimes; none of us are infallible – but this is a far cry from total delusion.

It should be noticed that we are well able to distinguish the two classes, i.e. ideas and objects. Hume does so in practice, though he denies our ability to do so theoretically. Indeed, how could his discourse be at all meaningful to him and us, if we could not all make the distinction? If apparent objects were truly no more than ideas, it is doubtful we could even imagine such a distinction; certainly, it would be logically self-contradictory in the way that Kant's dichotomy later was.

Thirdly, let us consider the facts of the case in more detail. Note that we ordinarily pass no time wondering whether our ideas are

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172 Hume obviously in fact believed in the existence of the external world, since he invested so much of his time writing and publishing books for others to read!

repeatedly conjoined, but only concern ourselves with their objects. Moreover, we might ask whether any two ideas are ever in our actual experience constantly conjoined; the answer seems evident to me – it is no. On the other hand, many objects do seem to us constantly conjoined.

Moreover, if we introspect sufficiently, we easily notice that ideas may become associated in our minds for reasons that have nothing to do with the objects they intend. Such association is not based on constant conjunctions, but on a single coincidence. The strength of mental association is not due to statistical frequency. For instance, a certain musical tune reminds me of a certain woman, just because it happened to be playing in the restaurant where we sat the day I met her. I may well have heard the same tune a hundred times before, without any association occurring.

This means that in our common everyday experience, without reference to Hume, the conjunction of ideas and the conjunction of the objects they intend are two quite different issues. *Even if* we observed our ideas and found them constantly conjoined, we would not necessarily conclude that the objects they intend are causally related; we are not (most of us) that stupid. As well, we are well able to believe two objects to be causally related *even while* our ideas relative to these objects do not readily arise together.

It is also worth pointing out that, intuitively, we have the volitional power (often if not always) to arouse or suppress ideas, whereas we do not seem to have similar power relative to apparent objects. We can ignore objects, or forget them, but that does not wipe them out: if we look for them again they reappear or someone else might still see them. But in the case of ideas, or more precisely many memories and derived imaginations, we experience a greater power of manipulation. On this basis, we expect the associations between ideas to be more tenuous: they depend more on our will.

All such simple observations and arguments again take us to the conclusion that Hume indulged in an excessively hurried generalization, from very little introspection and reflection. He was either lazy or dishonest, focusing on the data that supported

his pet theory and ignoring the data and reasoning that contradicted it. The matter is open to objective judgment – it is not my word against his: everyone can carefully consider the data and judge independently.

The philosophical sciences of logic, phenomenology, epistemology and ontology provide the blueprint and guidelines for induction. There is of course additionally the need to consider the psychology of induction, since after all induction is an activity of the human psyche. Through such a complementary study, we can better comprehend how induction actually occurs. But psychology and logic are two very different fields.

Briefly put, I would describe the psychology of induction as follows. The human soul has powers of cognition, volition and valuation. All three of these functions come into play in every inductive act. The end is cognitive; the means is volitional (combined with non-volitional elements, provided by the nervous system, mainly the brain); the motivation comes from the valuing of knowledge, or the things or events that knowledge can serve as a means to.

The relation between the said philosophical sciences (including logic) and the psychology of induction (in an individual at a given time) is that the sciences (to the extent that they are known to the person concerned and kept in mind) *influence* the inductive activity of the person. They do not determine it, note well, but they influence it. This relationship thus leaves room for the cognitive, volitional and value-oriented factors of induction.

If the person has a low degree of knowledge or understanding of the scientific underpinnings of induction, he or she will naturally often make errors. However, even without formal training and reflection on the issues of induction, most people do subconsciously frequently think logically and thus a lot of the time have some measure of success in their inductions. Humans, after all, have considerable natural intelligence; else they would not have survived till now. The said sciences are, after all, very recent productions of the human mind.

The root of Hume's problem with induction is perhaps his misconception as to what ideas[173] are. I suggest that in his mind's eye, ideas are clouds of 'mental stuff' produced by sensation. These perhaps very often look like the objects that generated our sensations, but we cannot be sure of that since we have no access to such objects other than through ideas. Thus, what we actually perceive and know are only ideas. Thus, ideas are veils that separate us from reality, rather than conduits to reality.

This view is, as already pointed out, self-defeating, since it accuses also itself of ignorance and error. However, the point I want to stress here is how ideas are *reified* in Hume's discourse. Because he effectively visualized ideas as atoms of mental substance, his view of human knowledge as a whole was completely distorted.

In fact, an idea is something very abstract, an intention[174] towards some object, a *relation* of pointing in a certain direction, directing our attention hither, rather than a substantial entity. An idea is an idea *of* an object. It has no existence apart from an object of some sort (although, of course, the object concerned need not be real, but may be illusory).

It is certainly true that the physical processes of sensation play a central role in our noetic relation to a domain beyond our apparent physical body. But *it does not follow* that what we

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173 Whereas Locke used the word idea very generally (including all mental phenomena, even emotions), Hume distinguishes primary impressions from derivative ideas, i.e. simple empirical sensations from the more complex mental constructs made with them. However, I here use the term idea much like Locke, because Hume's finer distinction does not affect the issue at hand.

174 The word "intention" is very well chosen here, note well. It is not the idea, or the name for it, that intends the object – it is us, we the subject, who do. The word does not refer primarily to an act of consciousness, in the sense that Husserl defined consciousness with reference to some mysterious "intentionality," Consciousness is not essentially an action, but rather a receptive event. No, intending refers to *an act of volition*. The subject (I, you) programs such an intention into every notion or symbol he produces. The subject wills his attention (awareness, consciousness) in the direction of the object concerned when he again comes across that idea or word. When we communicate, we pass such guides to mental action to each other.

perceive when we sense this 'external world' are sensations or even images[175] of the world.

- **The only coherent theory is that what we perceive is *the world itself*.**
- **The images we form in our minds of such primary perceptions are only ex post facto *memories* of what we perceived[176].**
- **The abstract concepts we form thereafter are not mere manipulations of concrete memories, but *relations we intend to the objects initially perceived*.**

The fact that we perceive external objects, and not impressions or ideas of those objects, is certainly marvelous, so much so that we still cannot understand how that might happen. But our difficulty and failure to explain this marvel of nature is not a reason enough to deny its occurrence. That we perceive the world is obvious enough; how such a thing is possible is a distinct question, which we may never answer. Science does not

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175 A verbal problem to always keep in mind is the equivocation of the word "sensations": used in a general sense it refers to all sensory material, whereas more specifically it makes us think of touch sensations. Likewise, the word "images" tends to evoke visual images, but in the present context it is meant to refer to any resemblance, i.e. equally to auditory and other sensory phenomena. Such equivocations may seem anodyne, but they mislead many people.

176 More precisely, **memories** are *physical* items (produced by sensations of visual and auditory phenomena) stored in the brain, which, when (voluntarily or involuntarily) reactivated, project *mental* images or sounds that we inwardly perceive and recognize as previously directly perceived (in the physical world, when that is the case). In the case of smells, tastes or tactile phenomena, I suspect we cannot in this way 'recall' past or present perceptions, but only 'recognize' them as familiar, so the term memory has a slightly different meaning. Note well that we do not commonly confuse our perceptions of material things and events with our memories of such perceptions; it is only armchair philosophers like Locke and Hume who equate these two experiences, quite unthinkingly.

normally deny the very existence of what it cannot thus far explain.

Note well, we can claim knowledge *that* we directly perceive the external world itself, without claiming to know yet *just how* we manage to do so. We know we can, because this is the only consistent theory we can posit, as already explained. But exactly what role the senses and brain play (other than memory production, storage and reactivation) in this evident direct perception is still an open question. The fact that a partial question remains does not invalidate the truth of the partial answer already obtained. There are many issues in the special sciences that remain unsolved to date – and we do not for that reason throw out the knowledge we already have.[177]

It does not follow from such non-skeptical, objectivist theory of knowledge that perception or conception can never be erroneous. Errors in human knowledge are essentially conceptual, and it is the task of logic to minimize them. Perception sometimes seems wrong, after the fact, due to our noticing later percepts that seem to contradict the earlier. In such cases, we realize that in fact we drew some conceptual inference from the initial percepts, which the later percepts make clear was unjustified, and we correct our previous assumption. This is just an application of the laws of thought and the principle of induction to sorting out conflicting perceptions.

Once we comprehend human knowledge in this truly enlightened manner, it becomes clear why Hume was so confused and self-contradictory in his views of induction, and other logical and philosophical issues. If one starts with false

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177 For example, just what is a “force” like gravity in physics? Or just what is “energy”? Isaac Newton admitted his ignorance, saying “*hypotheses non fingo*” (meaning, I have no explanation); and even after modern developments in physics, like the Relativity and Quantum theories, we still do not know just ‘what’ these abstractions refer to concretely or ‘why’ these processes occur. Despite this partial (and even crucial) ignorance, we do not consider physics less of a science. For what is science? It is not omniscience, but merely a guarantee that our current opinions are the best possible in the current context of experience – because the most *rigorously* induced.

premises, one is very likely to end up with false conclusions. He should have been more careful.

Philosophers like Hume have always found the idea that we might indeed be perceiving and conceiving the world out there, and not merely our impressions and ideas of it, difficult to comprehend or explain. This is understandable, because this seeming ability of ours (viz. external consciousness) is something truly surprising and, well, *miraculous* – no better word for it comes to mind.

But then these same philosophers take for granted that our inner perceptions and conceptions are valid and not in need of explanation. They apparently do not realize that this ability (viz. internal consciousness) is also miraculous – indeed, just as miraculous. For the difference between the two, after all, is just one of distance. And who is to say how big the soul (the subject of consciousness) is or where it is in fact located? Why do they assume that it is more 'inside' than 'outside' the apparent body?

In both cases, there is something marvelous, inexplicable – namely consciousness, a line of relation between an object and a subject. How can one existent (a soul, a spiritual entity) experience another (a mental or material phenomenon)? In the case of self-intuition, the subject and object are exceptionally one and the same. But even this is a marvelous event, that something can experience itself.[178]

The mere fact of consciousness is the biggest mystery. In comparison to it, the issues of how far consciousness can go, and how in some instances it is aroused and made possible by sensation and yet the body does not block or distort our view – these are relatively minor issues.

Of course, a theory of the exact role of the senses remains highly desirable. Obviously, each sense organ (whether in humans or other animals) somehow gives the overall organism 'access to' a range of data of a specific sort, and no other: e.g. human eyes open the window to a range of light waves (the visible spectrum)

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178 I leave open whether we can experience *other* souls. Some people suggest it is possible, i.e. claim a sort of other-intuition. Some people claim even to have experienced God.

but not to all frequencies (not to radio waves, ultraviolet rays or microwaves, for instances) and not to other modalities (such as sound or chemical signals). The different sense organs have evolved over millions of years (at different rates and in different directions in different organisms).

Without these sense organs, we would not (so it seems) be able to sense external reality. So, their role is not only that of memory production, but they are somehow essential to the actual contact between the organism as Subject and material objects it perceives. Even so, to repeat, it cannot consistently be affirmed that what the Subject perceives are internal products of sensation. Nor is the explanation that sense organs serve to filter out some of external reality sufficient. The sense organs must have a more significant role in the Subject-Object interface. But what?

2. The Induction of Induction

[…]

Upon further reflection, my reaction to the anti-inductive trend set by Hume is more muted, as follows.

Deductive logic was largely the discovery and production of one man, Aristotle (who, of course, had a great teacher, Plato). It has grown considerably since then, thanks to the contribution of many, but its founder's work is still very present at its foundation. Of course, people engaged in deduction before him, but he brought an enormous amount of self-consciousness and precision to such logical thought. Under his direct influence, many people made fewer errors of deduction.

On the other hand, what *the history of the logic of induction* makes clear is that this basic discipline was not born long ago and in one go. Retrospectively, we can of course say that induction has always been used by humans, and even in a sense by their animal forbears and cousins. We have always practiced induction, with more or less effectiveness, without need of logicians and philosophers to describe and explain it.

Aristotle and his successors were of course conscious of induction to some extent, but not sufficiently to develop a

systematic theory of it. The theory of induction dawned in more modern times, with (I would say) Francis Bacon. The latter's work was more important than many realize. After him, whether under his influence or independently, physical scientists like Galileo, Newton, and many more till this day, both used and understood induction with increasing clarity.

On the other hand, the direct philosophical successors of Bacon, like Locke, Hume, and many others till today, never quite succeeded in bringing the logic of induction he had started up to date[179]. In some respects, they even regressed, rather than progressed. It is really surprising just how widespread skepticism about induction remains. Hume seems to have permanently impressed his disbelief to a great many later thinkers.

To give you one modern example, two hundred years after Hume – A. J. Ayer reports that Bertrand Russell thought that the assumptions of scientific thought had to be taken on faith, and that (in Ayer's words):

> *... there is no necessity other than logical necessity, so that there is no such thing as causal necessity. Causality is just a matter of what Hume originally said it was, namely constant conjunction, and is something purely contingent.*[180]

Ayer agrees with him. Many other philosophers and logicians similarly assume induction to be without any solid logical basis, and express surprise that it works at all. It is not that they have some bias against inductive reasoning; they would dearly love to prove it, because they are empiricists at heart and supporters of modern science. What the example of Russell makes evident is that they are sincerely baffled.

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179 While scientists were showing enormous ingenuity in the design of experiments and more broadly in the formulation and selection of theories in their respective fields, the general understanding and justification of induction by philosophers and logic specialists have often lagged far behind. In modern times, the likes of Karl Popper have of course brought greater balance between the theory and the practice of induction.

180 See Magee, pp. 313 and 315.

All this teaches us an important lesson. It is that *the induction of a theory of induction* has taken time, a lot more time than anyone would have thought it would take. And this is quite normal and okay – the question is not simple, so we should not be too surprised that many have failed to answer it satisfactorily. After all, induction is a trial *and error* process. It allows for error, and for long spells of blindness and incomprehension.

The history of science is replete with similar situations[181]. Certain facts were (it seems to us, retrospectively) glaringly obvious, yet scientists went through great pains till they saw them. Many facts were for long periods devoid of explanation. Similarly, in the history of logic, although Bacon had well specified and stressed the importance of the negative instance in induction, Hume just ignored the advice in his formulations on induction and causation.[182]

Thus, after due consideration, we should look upon Hume and similar skeptics without bad feelings, with compassion. The modern discovery of induction and the attempts to formulate a theoretical description and justification of it – were all part of a learning process. If many found it difficult, and drew hasty defeatist conclusions, they ought not be blamed. They did their best, albeit without too much success. We are all fallible and none of us all-knowing.

Letting bygones be bygones, now the task is to educate people, to teach the principle of induction and all the methods that derive

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181 Stephen Jay Gould documents many such stories and gives us illuminating methodological comments on them, in a set of essays I strongly recommend. See for instance his comments on pp. 96 and 97, on the "long struggles to think and see in new ways" and on "shining a light of logic into the most twisted corners of old conceptual prisons, into the most tangled masses of confusing observations."

182 It is a bit shocking to discover, upon close scrutiny, just how often errors of reasoning and plain ignorance occur in Hume's work – and indeed in the work of many other great and lesser princes of Western (and for that matter, Eastern) philosophy. I remember my similar surprise and disappointment when, after completing *The Logic of Causation*, I revised my analysis of J. S. Mill's "methods of experimental inquiry," and discovered how many mistakes a very educated and intelligent man like him could make.

from it. Enough of negativity, skepticism and pessimism; let us not perpetuate these historical faults. Instead, let us inaugurate a new era of general mental health and good intentions.

3. Some Further Remarks on Causal Logic

The following notes are intended to amplify my past writings on causality.

The fallacy of reductionism

In my research on the logic of causation, I established that "a cause of a cause of something is not necessarily itself a cause of that thing" (see list of valid and invalid causative syllogisms for the precise conditions when this applies and when it does not).

It occurs to me that this result can be interpreted as *a formal proof that "reductionism" does not always apply*.

When we try to 'reduce' something to its constituent parts, we are saying that the laws that apply to the parts ultimately apply to the whole; i.e. we are saying that the whole is no more than the sum of its parts. This is sometimes true, but it is not always true. It is true when the following syllogism is valid, and untrue when it is not.

> Y causes Z, and
> X causes Y,
> therefore, X causes Z.

In some cases, I say, though the whole (Y) have a certain property (Z), it does not follow that the part (X) has that same property (Z). In such cases, the whole may logically be said to be more than the parts. For example, though the whole of a live human organism has consciousness and volition, it does not follow that any of its parts has these powers.[183]

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183 See also for example, Gould, p. 283.

It should be added that this insight of causal logic is valid for all modes of causation. That is, it can be equally said of natural, extensional, spatial, temporal, or logical causation. Thus, reduction or irreducibility has as many senses as there are modes of modality. It follows that something may be reducible in one sense, but irreducible in another.

We thus have, precisely listed in my work *The Logic of Causation*, the formal rules for impartially settling debates about reduction in specific cases. Reductionism is sometimes applicable and sometimes not; and we have a way to tell just when it is and when it is not. Reductionism is a fallacy, note well, not because all reduction is fallacious, but because reduction is in some cases fallacious.

Incomplete listings of causes

It should be added that the above schema is not the only way reduction occurs fallaciously. Sometimes, reduction consists simply in declaring a number of things to be partial or alternative causes of a phenomenon. The possible fallacy in such cases consists in *incomplete listing of partial or possible (i.e. contingent) causes*. Even though the things proposed as causes are indeed causes – the list proposed is incomplete. The effect of such too-short listing is to narrow our vision and multiply our wrong causal judgments. That is why we must call it a fallacy: because it makes us reason wrongly.

For example, the expression "nature or nurture" is usually understood as signifying that the causes of physiological and psychological phenomena are genetic and/or environmental[184]. But there is a *third* possibility or partial determinant: viz. volition. Volition signifies personal choice and effort, self-generated change; it is quite distinct from and even antithetical to physical and mental causations. To omit it from the list is to bias judgment away from it, towards more deterministic biological and psychological forms of explanation.

This missing disjunct might be generously understood as implicit in the others, but in truth it is not so. Often, when people

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184 See for example, Gould, p. 288.

speak of nurture, they have in mind the influence of other people – for instance, parents and teachers in the learning process. This is indeed ‘nurture’, though we must keep in mind that it refers to acts of volition by other people, which influence the volition of the subject. However, to think in such terms alone puts insufficient emphasis on the subject’s will – in this instance, the subject’s will to learn. To classify this too as ‘nurture’ would be inappropriate. It is definitely a third factor, viz. personal choice and effort. Thus, we should always speak of “nature and/or nurture *and/or volition*” when explaining human behavior.

Note that the disjunction “genetics and/or environment” is even worse than “nature or nurture,” because the word ‘environment’ need not imply any human interference at all, whether that of others or one’s own. It connotes the effects of the weather, food composition, agents of disease – anything but human action. The choice of this word is rarely accidental. There is a tendency among many modern scientists (biologists, physicians, psychologists, etc.) to deliberately avoid any explicit mention of volition in their explanations. They think that mention of volition would make their discourse unscientific, and are afraid to lose credibility among their peers. So, even if they think of volition as a relevant factor, they keep all references to it tacit. Such discursive behavior is not honest or intelligent.

A common causal argument

Quite incidentally here, while on the topic of causal logic, when we say that something (X) is the causative of something else (Y) *in an individual case*, we mean that from all the possible causes of Y *in general*, the cause X is in this case the one applicable. For example, to say that John died of a heart attack, we need only verify that John’s heart had a serious enough problem, and no other possible cause of death occurred in this instance; and thus, by demonstration and elimination, we conclude that John died of a heart attack.

This is stated in support of the claim already made that causation always relates to *kinds*, not to individuals. When we identify causatives in individual cases, we are not identifying the general fact of causation, but its particular *application* to a given instance. Thus, in our example, we know from general scientific

studies that a human being can die from a variety of causes. When a particular human being dies, and we wish to know "the cause of death," we use our general knowledge in disjunctive form as the major premise in an apodosis with an appropriate minor premise concerning the individual case.

The argument runs as follows:

> Death in a human being may be caused by heart failure, or cancer, or… etc.
>
> In John's case, we found some evidence of heart failure, and no evidence of any other possible cause of death.
>
> Therefore, John (probably) died of heart failure.

Of course, this argument may be found erroneous, if it turns out that the list of causes of death is incomplete, or if it is found that certain other problems in John had not been spotted. For this reason, it is wise to qualify the conclusion as only probable, in the way of reminder of the inductive assumptions behind the deduction.

Positivism

Positivism may be viewed as a thesis going in the opposite direction to reductionism, or putting a stop to the urge to reduce. It is a (sometimes arbitrary, sometimes wise) refusal to dig any deeper or look any further for underlying causes or explanations.

An example is the Heisenberg principle of uncertainty. This is regarded by some philosophers (notably Neils Bohr), somewhat arbitrarily (in the way of a concession to the 20th Century's *zeitgeist*), as an epistemological principle (implying doubt in our very ability to know, since our antennas of knowledge are limited in scope), whereas it is really no more than a principle of physics.

The wave-particle duality is often presented as an empirical refutation of the law of non-contradiction. But this is an unfair interpretation of events. The facts of the case are that an ongoing physical phenomenon may *in some circumstances* behave with the mathematical properties of a particle and *in other*

circumstances behave with those of a wave. *The circumstances involved are certainly not one and the same.*

There is empirically no *actual superimposition* or 'interbeing' of wave and particle in the same respect, in the same place, at the same time, in the same perspective of the onlooker. The two states are clearly separated by space, time or other circumstances. Therefore, the law of non-contradiction is in fact never breached. Therefore, no epistemological or metaphysical difficulty arises.

The problem raised by the wave-particle duality is at worst merely rational: it is a surprising inability of our *theoretical* instruments, i.e. physics theory and experiment as well as mathematics, to fully predict and explain such goings-on of material phenomena.

Thus, we could say in rebuttal to the positivists of uncertainty that what prevents us from full knowledge at the quantum level is one or all of the following:

- Perhaps as they claim the physical world is really so roughly constituted that there are no finer levels of matter in this world than what we observe. In that case, our cognitive faculties are not to blame; the world is like that. But then, how can we know it for sure?
- Perhaps the world in fact has finer, deeper levels, but our sensory faculties and experimental instruments are inadequate to the task of detecting and measuring them. In that case, it is not inconceivable that more sensitive experiments be devised someday that do make physical detection possible, directly or (granting certain physics hypotheses) indirectly.
- Perhaps the mathematical tools currently at our disposal are inadequate. In that case, it is not inconceivable that someday we develop a mathematics sufficiently sophisticated to seamlessly unify the quantum phenomena observed.

Our faculties of perception and our intelligence are, it is true, *limited*. We might conceivably have had a sensory faculty strong enough to allow us to differentiate particles from waves, but we unfortunately do not. We might have found some indirect way

to do so, but we did not – so far, at least. We might have developed a mathematical theory capable of dealing with the problems encountered, but we did not – so far, at least. In that sense at most, the uncertainty principle might be viewed as an epistemological statement.

But people who think thus forget that their conceptual faculties (though also not unlimited) have compensated this sensory and technical limitation, if only enough to realize the (currently apparent) truth of the uncertainty principle. Therefore, the problem is essentially factual rather than epistemological. It does not put in doubt human knowledge as such, but is an expression of it. Our knowledge is limited in scope, but not for that reason necessarily false.

It is important to emphasize in this context the modern tendency to infer an "is" from a "might be," This fallacy is evident in Bohr's inference from an uncertainty (as to what lies at a deeper level of matter than what we are 'on principle' – at the present development of physics, at least – able to observe) to a certainty of negation (i.e. to a certainty that there is nothing beyond). The same fallacy is found in Goodman's inference of blue (a specific color) from 'grue' (a range of possible colors).

The causation in 'fields of force'

Someone looking at the definitions and analyses of causation in my book *The Logic of Causation* might well wonder what all that has to do with the 'fields of force', like gravity, electricity and magnetism (to name just the more widely known), which are at the core of modern Physics theory. The answer to that question is already proposed in my *Judaic Logic*, Appendix 1.3.

We describe *the force at each point in a field*, around some central 'particle' or 'body' (collection of many and varied interacting particles), by means of if-then statements. These have roughly the form: "another body with such and such characteristics (e.g. mass, electric charge or whatever appropriate) placed at this point in that field (i.e. at a certain position relative to the central body concerned) will be subject to a force of magnitude and direction so and so, calculated using a certain quantitative formula (a hypothesis previously developed by inductive logic, e.g. an inverse square law),"

Needless to say, this proposition is *merely descriptive*: it does not tell us why or how such (invisible and remote) force occurs at all – I leave this difficult question for physicists to answer!

Such if-then statements, which are *natural or extensional conditional propositions* in formal logic, are the underlying causal (or more specifically, causative) propositions analyzed in my causative logic work. It is important to realize that the causative propositions corresponding to fields of force generally relate to *partial and contingent causation*, since forces may amplify or diminish each other (and, in some instances, cancel each other out). That is to say, the relation of force operative between two bodies, calculated by means of the pertinent algebraic formula, is applicable to them as is only granting that no other bodies are in their vicinity. It goes without saying that if more forces are involved at the same time, their net effect has to be calculated before we can correctly predict the subsequent motion (if any) of the body or bodies concerned.

Speaking of motion, can the motion emerging from fields of force be described as motion arising from rest? In my *Volition and Allied Causal Concepts*, chapter 8.1, I suggest that the generation of motion from rest is a distinctive characteristic of volition.

On the surface at least[185], fields of force would seem to belie this claim of mine. For example, hold a stone above the ground, then let it fall; or again, place two light magnets next to each other well at rest, and when you let them go they will either attract or repel. In such cases, acceleration from rest evidently occurs. Yet this is clearly different from what we suppose volition to do. In the case of gravity or magnetism (or other sorts of field-forces), the movement is preprogrammed, i.e. in the same circumstances it will always be the same in magnitude and direction. Whereas in the case of freewill, the same agent may in the same

185 Physicists might eventually, or maybe already have, come up with a more dynamic vision of the workings of fields. Some theories seem to suggest they involve particles or waves of some sort in motion (e.g. gravitons). But here, let us take fields at their face value, so to speak.

circumstances choose a different magnitude and direction of will. In the latter sense, volition truly initiates motion from rest.

Notice, too, that in the examples above given, volition was involved in bringing the stone or the magnets in their starting positions, and they were held momentarily stationary there by volition. The motion in these objects is as it were artificially held in abeyance; whence the physics concept of ‘potential’ energy. Motion is the main configuration of the natural world (the domain of deterministic causality, or causation), while immobility in it is due to a temporary balance of opposite forces. In the spiritual world (i.e. the domain of personal causality, or volition), in contradistinction, motion emerges occasionally and somewhat voluntarily from something essentially at rest.

Leibniz’s ‘pre-established harmony’

Hume’s attempt to weaken the bond of causation can be rooted to some degree to the doctrine of ‘pre-established harmony’ found in the philosophy of Gottfried Leibniz[186]. This idea substitutes a sort of *parallelism* for the common concept of causation. That is to say, according to this doctrine, the putative cause and effect *just happen to* regularly occur together or in sequence.

The observable regularity is, according to Leibniz, not due to a causal relation or connection between the two phenomena (here labeled putative cause and effect). Rather, each functions independently according to its own nature, yet they happen to (or were programmed by God to) be in phase. This can be illustrated by reference to two clocks that happen to always show the same time, though their mechanisms are not linked.

I mention this doctrine here so as to refute it, for it may have a semblance of truth in it due to common misunderstanding of the nature of causation. For after all, what is what we call the nature of things but the *happenstance* of their various observed characteristics? But the concept of causation is not based on mere actualities; it relies on modal concepts, i.e. on the concepts of possibility and necessity. And in particular, natural causation

186 Germany, 1646-1716.

is based on the corresponding natural modalities. The concept goes beyond perceptual data, though we try to base it on such data.

That is to say, to claim that (for instance, using the strongest determination of causation as our example) P is a 'complete and necessary cause' of Q is not merely a claim that presences of P are accompanied by presences of Q and that absences of P are accompanied by absences of Q. No – it is a claim such togetherness or sequence of events does not merely not-vary, but is invariable. It is necessary; i.e. in the case of natural modality: it is a natural necessity. Or in other words: its negation is impossible by the nature of the things concerned. If no such claim is being made, we cannot truly say that we are discussing causation.

This can be made clearer if we look at the matricial analysis for the determination in question, i.e. the following simple table (drawn from my book *The Logic of Causation*):

Table 33.1 Matrix of "P is a complete and necessary cause of Q."

Items		Relation
P	**Q**	**mn**
1	1	1
1	0	0
0	1	0
0	0	1

In this macroanalytic table, the "1" and "0" under the items P and Q signify respectively presence and absence of those items in different combinations. But the "1" and "0" under the relation "**mn**" (symbolizing complete and necessary causation) mean respectively "possible" and "impossible," That is to say, in the

latter case, mere continued non-occurrence of the PQ combination concerned is not sufficient to prove the stated causation, there has to be an assumption that such combination will never occur, because it cannot occur. Such proof is logically possible thanks to the principle of induction, and it is possible only by this means.

Leibniz's doctrine effectively accepts temporal causation, spatial causation, extensional causation, and even logical causation, but arbitrarily rejects natural causation. These various modes of modality and thence of causation are all identical in principle, differing only in the basis of generalization (and if need be particularization) they involve. Temporal necessity ('is always') requires generalization from some to all times of some existent; spatial necessity ('is everywhere'), from some to all places of it; extensional necessity ('is in all cases'), from some to all instances of some concept; logical necessity (however expressed), from some to all contexts for some knowledge.

The only distinction of natural necessity (again, however verbally expressed) is its requirement of generalization from some to all circumstances surrounding some event. If one sort of generalization is admitted, there is no technical justification for rejecting any other sort; the epistemological process and inductive argument is identical in every case. As already explained, individual acts of generalization may turn out untrue, but the process cannot be denied in principle without self-contradiction. Hume makes the same error, as earlier shown.

It should be added that Leibniz concocted this non-modal (i.e. exclusive of natural necessity) causal theory to buttress his bizarre theory of "monads," according to which the world is populated by entities (called monads) existing and functioning entirely independently of each other. To explain how come, despite their claimed mutual independence, we can observe seemingly coordinated behavior patterns among things, he postulated the idea of pre-established harmony.

Moreover, this was not, in his view, mere coincidence, but an illusory order deliberately programmed by God. It apparently did not occur to Leibniz that the concepts of independence and Divine programming of the monads required a modal

understanding of causality for their formulation. He was effectively saying that worldly events do not cause each other, but do have as common cause God; that is still an admission of causality as such. He was thus tacitly involved in concept-stealing or self-contradiction - unless we consider that he was not like Hume denying causality *de jure* (in principle), but only *de facto* (in a limited field).

The deeper problem with Leibniz's theory of independent monads is its imposition of a grand 'purely rational' construct on reality, irrespective of experience. This is an example of what Boorstin has aptly called "the German *a priori* method" (p. 237). We find the same psycho-epistemology in Kant and Hegel, and many other (though not all) German philosophers – a propensity to build massive intellectual systems (based on a few tendentious observations and insights, and blithely ignoring contrary empirical data and logical limitations). This is not only a failure of due empiricism, but more broadly of understanding the many demands of objective human induction. These thinkers – for all their intelligence and valuable contributions – get romantically carried away by their arcane conceptions, without regard for their obscurities and anti-empirical aspects. They are emotionally driven by the ambition to be the Big Genius who solved all the problems in one sweep, and so easily enthused by apparent panaceas.

4. Addenda (2009)

The principle of uniformity

Concerning the principle of uniformity, discussed earlier on, it should be noted that the underlying assumption of this principle is the particular proposition "some things (whether elements of experience or products of abstraction) have some characteristics in common," This is clearly not a generalization, because it is not a generality! It is merely an admission that the world we face seems to have some repetitiveness in it, without any prejudice as to the extent of such repetition

And as to how this particular proposition is known to be true – it is not so much by experience as by logic. For if we tried to

claim its contradictory, i.e. that "nothing has any characteristic in common with anything else," we would be guilty of self-contradiction, since the use of any concept whatsoever (like "thing," "has," "characteristic," "in common," etc.) relies on a supposition that two or more things have certain characteristics in common, thanks to which we may give them a common name. And it cannot be said that things have nothing in common other than the name we conventionally apply to them (Nominalism), since even appeal to a common name implies that the two or more instances of the name concerned are recognizably "the same" name, so that is an inconsistent objection.

Thus, the principle of uniformity is based on a logically necessary particular proposition.

Thomas Reid

In the discussion of sensory perception earlier on, I forgot to mention Thomas Reid (Scotland, 1710-96). Although modern histories of philosophy tend to ignore him or gloss over him, this contemporary and fellow countryman of David Hume's was during his lifetime more respected than the latter, because of his common-sense approach to philosophy. Reid rejected Hume's (and others') skeptical claim that what man perceives are internal impressions, i.e. mental products of the physiological process of sensation, and ably defended the direct realist view that what man perceives are outer physical causes of the sensations. Hume was aware of Reid's criticism of his work, but remained indifferent to his arguments although they were more perspicacious and reasonable than his own. Later, too, Immanuel Kant (a younger contemporary of Reid's) paid little heed to Reid's arguments.

It should be noted that direct realism is sometimes wrongly confused with naïve realism. These are in truth not identical philosophical concepts, though they may on occasion overlap. Naïve realism essentially refers to the worldview of the common man, who takes for granted the reality and materiality of the world apparently around him without asking questions as to the veracity and substantiality of such appearance. Direct realism is perhaps logically implied by naïve realism, but certainly does not reciprocate such implication. Direct realism is the view, as

already stated, that we perceive the world itself and not alleged mental representations of the world.

Opponents of direct realism claim that advocacy of this philosophy can only be arbitrary say-so or circular argument. However, this accusation is untrue. The main justification of direct realism is the manifest logical inconsistency of the opposite view, advocated by Hume, and John Locke before him and Kant after him. Impressions, ideas, representations divorced in principle from external objects lead inevitably to self-contradiction – and are therefore far more flawed methodologically. One cannot claim ideas or impressions to represent (i.e. give indirect access to) anything beyond representation if one first claims to have no direct access to anything beyond them. As of the moment the advocate of direct realism has thus (and in many other ways) argued his case, he can no longer accurately be accused of naïve realism. His realism must be labeled (relatively) subtle, instead.

However, the most important and precise distinction between naïve realism and subtle realism lies not in the self-contradiction of the antithesis of direct realism, but with reference to phenomenology. If the direct realist is content to claim that sensory perception is perception of physical reality (as against representations of it), he is still functioning on a relatively naïve level. His understanding is fully subtle only when he comes to understand that the preceding is an inductive hypothesis (better than any other) that admits the phenomena perceived as *ab initio* mere appearances (i.e. not as necessarily realities or necessarily illusions, but as possibly realities and possibly illusions).

Thus, though Reid's common-sense approach to direct realism was logically preferable to Locke's, Hume's and Kant's absurd representational cognitive philosophies, it was perhaps not the final word on the subject, since phenomenology was still not very developed. That is not to say there was no phenomenology in Reid's approach, but only that it was not a thoroughgoing phenomenology. Reid, in any case, did not claim to have answered all questions regarding direct realism, and indeed to date many crucial problems have remained unsolved (as explained my main text).

34. CONTRARY TO KANT'S UNREASON

Drawn from Logical and Spiritual Reflections (2008), Book II, Chapters 4(part),6,9:1.

1. Experience, Space and Time

Among Kant's fundamental errors was his assumption that empirical data is initially without unity, being a confused mass of myriad sensations, and that it needs to be united by rational means of some sort, *before it can at all constitute an object of perception*.

On this basis – and the use of many arbitrary assertions and woefully circular arguments[187] – he argued for the primacy of his a priori "forms of sensibility" (pure intuitions of space and time), i.e. that such "knowledge" of space and time is antecedent to (if not precedent to) any experience to which they are applicable and which they sort out and explain.

On what basis could Kant possibly claim to know that raw data is not unitary and needs unification, if he denies the possibility of access to raw data without a priori categories? How would he know about raw data and about the a priori forms, without reference to them first? How would he explain and justify his claim? Such a claim on his part is (if not plainly self-contradictory) of necessity arbitrary; it constitutes a hidden first premise of his philosophical system that he treats as axiomatic without valid reason. There is nothing obvious or absolute in this assumption of his. It is an unnecessary complication and mystification of the theory of knowledge. No transcendental knowledge of any sort is involved, but just say-so.

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187 Which I will not get into the details of here – to avoid turning this essay into another thick book. Some replies to Kant's arguments are effectively given in this section further on, when I present an alternative thesis.

On the surface, Kant's supposition that sensations need to be integrated before perception becomes possible might seem reasonable. If the perception is as commonly described perception *of mental products of* sensations, i.e. if what we perceive are presumed "representations" rather than the presumed external causes of sensations, then indeed one would expect some mechanism to fuse together the myriad sensory impressions (of the various sense organs, and the many parts of each sense organ). In ancient philosophy, this was called the "common-sense;" in neurology, one would refer this task to the brain.

However, this explanation of the role of sensation is a far from certain *theory*. Indeed, as I argue repeatedly here and elsewhere, it is an internally inconsistent and therefore untenable one. But even ignoring the paradox it entails, just consider the empirical facts involved. We cannot credibly even suppose that sensations are numerous and complex enough to produce images, sounds and other phenomena *as rich as* those we encounter in perception of physical objects.

When in my daily walks I look at the blue sky, the mountains, the lake, the greenery, the passersby and the colorful ducks, I do not for a moment suppose I am seeing images of such things great and manifold in my head, but naïvely consider that I see the things *themselves*. To opt for the hypothesis of images would mean that I am producing or reproducing in my mind an enormous quantity of data; just think of the amount of information involved in such an experience. Why suppose I am experiencing a parallel universe in my head, when I can *just as easily* suppose that I am seeing the universe itself? There is a difficult hypothesis either way, so why not opt for the simpler, more obvious supposition?

If philosophy has any need of a "Copernican revolution," this admission of *perceptual realism* (as against the prevalent perceptual idealism) is surely it. It is a revolution much more radical than the one Kant proposed, and much more convincing.

This natural supposition of the common man seems much more reasonable than the one proposed by philosophers and scientists. It compares the qualitative and quantitative characteristics of

what we call mental phenomena and what we call physical ones. The contrast in clarity and complexity is all too evident, and sufficient to suggest *direct* perception of external objects. It is true that some dreams we have are very sharp; some so much so that they seem like 'visions'. But the large majority of visualizations and dreams are rather vague or approximate. Sensations could never conceivably suffice to reproduce the reality we routinely perceive.

Indeed, some scientists have expressed surprise at the simplicity of sensory messages (electrochemical processes in the nervous system), compared to the complexity of the content of consciousness they are supposed to produce. This suggests that ***the process of sensation has little if anything to do with perception as such, but rather concerns memorization***. Through perception, we independently judge the correctness and reliability of our simultaneous memorizations. Without this distinction, we would be hard put to explain how we evaluate individual memories, and judge them right or wrong; all memories would be uncertain, impossible to evaluate.

Memorization is what makes imagination possible. Imagination is only possible after and as a consequence of memorization, in the way of a rearrangement of memories of experiences or of abstractions from such memories. Mental phenomena are – it is much more reasonable to suppose – merely weak and imperfect reflections of physical phenomena. Imagination, the willful recombination of memories, does not affect what we perceive, but only what we remember. Imagined theses, i.e. hypotheses, can be tested because we can refer to perception independent of memory; if we had no direct perception of externals, but only apparent memories, it would be useless to recombine them, because we could never test them.

Memory of an experience is not identical with the experience. The experience is primary, a given; the memory is secondary, a construct out of sensations. Apparent memories of external objects could not properly be called memories until they are validated through independent, direct perception of those objects. Until then, they have the logical status of mere "impressions or ideas" (to use Hume's terminology) – i.e. they are just mental items, themselves not validated and therefore

incapable of validating others. This is of course the 'grain of truth' in Hume's theory, which gives it some power of conviction. But the 'husk of falsehood' in it is Hume's willful failure to take direct perception into consideration, which results in self-contradiction.

Memories can be 'good' or 'bad', i.e. accurate or inaccurate renditions of certain experiences. Memories can in time deteriorate (or be lost); we can also train our memory to improve. We judge memories with reference to the experiences they claim to represent or correspond to, using *adductive* techniques – which means we regard them collectively as somewhat hypothetical. We can instinctively[188] usually tell the difference between a memory and an imagination, but sometimes the latter are confused with the former. This is why we need adduction based on actual experience: to objectively judge the difference.

Mentalists and subjectivists express incredulity as to the possibility of direct consciousness of objects, and aver instead that cognitive processes necessarily produce mirages. It is unthinkable in their view that we directly perceive *physical* phenomena, but quite conceivable that we directly perceive *mental* phenomena. I ask: why this prejudice? Surely, the latter is *as amazing and inexplicable* as the former. In either case, consciousness of one thing by another is something best described as miraculous, for lack of a better word – whatever the presumed substance of its objects or distance from the subject. If we lose this sense of wonder, and regard consciousness as just some other routine "phenomenon," we are skimming over something very, very surprising.

Those who prefer inner perception to outer have no argument in support of their thesis. The very distinction between inner and outer depends on the presupposition that we can tell a difference between them, *if only in appearance*. It follows that, at a phenomenological level, inner and outer – i.e. mental and physical – are on the same plane, equally capable of being the true state of affairs. There is no *a priori* or *ab initio* basis for a

188 That is, by introspection or intuition, perhaps by "feeling" the different ways they are stored in the brain.

prejudice, one way or the other; the issue can only be resolved in a wider context, with the help of inductive logic.

The **phenomenological** truth of human knowledge is exactly the reverse of how Kant views it: first we experience raw data, and then only do we mentally process the information so obtained. Raw experience is *experience of the totality of the here and now within the immediate range of one's consciousness*. It is essentially pure of rational interference, though reason is quick to try sorting it out almost as soon as it occurs. Thus, experience is initially unitary and only in a second phase is it *rationally* made to explode into seeming multiplicity, with variations in space, time and circumstance.

This is a truth evident to anyone who has practiced meditation to the stage of contemplation. **One is constantly in the here and now, even though the scenery around one changes continuously in various respects**[189]. In this cognitive posture, one is observing without comment of any sort (verbal or non-verbal). And indeed, even if thoughts do arise, they are viewed as just part of the scenery. The non-here and/or non-now are mental projections in the here and now; we here and now remember or imagine things beyond the here and now.

The self *in fact* always resides in the here and now, even if its attention is usually strongly drawn towards some place else and/or some other time. There seems to be a natural force (of varying intensity) pulling us away from the here and now, perhaps for biological reasons of survival. Nevertheless, through a contrary effort of stillness and silence, we can volitionally bring our awareness back in the here and now; and with much training this can become a habit.

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189 This perspective perhaps explains the Zen *koan* "Bodhidharma didn't come to China" (Dogen, p. 152). It means: China came to Bodhidhama. That is to say, the stream of appearances associated with going to, being and traveling in China, *including* the appearances of Bodhidharma's body in the midst of these geographical locations, was present in front of (or all around) him – but he never moved, never went anywhere (other than where his soul was all along).

Buddhist psychology has, in my view, well explained what it is that draws us out of the 'here and now' into the 'there and/or then'[190]. It is the pull and push of desire (and aversion). We cling to (or away from) some passing content of the ever unfolding here and now, and become absorbed by it. Our attention becomes locked onto it for a while, fed by and feeding memories and fantasies. To avoid this malady, it is necessary to practice non-attachment.

The content of raw experience is essentially a continuous field, not only at any given moment but also from moment to moment. The division of experience into moments is already a rational act; experience itself is one across time. More precisely, experience is only of the present, and any consideration of past (memory) or future (anticipation) is rational rather than experiential. We are always in the present, whose changing appearance is all part of the present. Mental impressions of memory or anticipation may float over more present-seeming appearances, but they must be regarded phenomenologically as in the present too, and only separated out of it by rational reflection.

Similarly, the imaginary cutting up of the visual and other phenomenal fields into distinct parts – and on a later, more abstract plane, the distinction between whole and parts of space as such – this is rational activity that comes *after* actual experience. Such rational acts presuppose phenomena to act on, and therefore must lag slightly behind the experiences they are applied to. Nevertheless, they do not necessarily rely on memory, because what we experience as "the present" is not an

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190 Which we might identify with *nirvana* and *samsara*, respectively (though I do not pretend to have personally consciously experienced nirvana). Many useful illustrations are suggested by Zen masters in this context, such as: the still and empty self experiencing passing things and events is likened to *the hub of a wheel*; imaginations relate to other objects of experience like *clouds in the sky*, floating around in the foreground without really affecting the background. Note that the here and now is not a narrow expanse: since it has no boundary, it is potentially and therefore ultimately the "*vast emptiness*" of all space and time (to borrow a phrase from Bodhidharma in Dogen, p. 138).

instant, but a moment of time – i.e. the present has a temporal extension, it is not a mere point in time.

Thus, it is we who mentally cut experience up and then bind it together, through various rational acts. These acts occur in the present, like all existing things and events. Before we can locate ‘parts’ of experience variously in space or time, or classify them together in any way, we must differentiate them from each other. For example, we may choose to consider visible blobs of colors as distinct things; thereafter we may regard these items as spatially or temporally separate, or this color and that one to be the same or at least similar (the same to some extent but differing in shade, say).

It is clear from such analysis that locating things in space and time is a relatively complex act of reason. Before we can actually give things spatial and temporal dimensions (positions, shapes and sizes), we have to engage in numerous simpler acts of dividing and discriminating, equating and differentiating, comparing and contrasting, isolating and reassembling. Note that all of these acts involve affirmation, and some involve negation; they constitute rational judgments based on experience. But note too that none of these judgments need involve words, though they often do so because this facilitates them (especially when they are numerous and tangled).

Kant would regard all such rational acts as involuntary a priori characterizations of experience, but they are clearly not that. They are essentially voluntary acts of conceptualization, of various degrees of complexity. Usually, such acts are so deeply habitual that they are almost automatic. But in truth, they cannot be claimed automatic, because: (a) very often we lazily skip doing them altogether, and (b) if we do choose to do them, we must make a conscious effort to get them done.

Generally, the simpler conceptual acts tend to be done unthinkingly, whereas the more complex ones require more of an intellectual effort. No doubt, Kant was partly misled by this common observation into regarding space and time as “intuited” instead of as conceived. Contrary to what Kant suggests, no conception is needed *to experience* raw data. Concepts are later cognitive tools, used to organize the data *already* experienced,

so as to draw inferences from it and build theories around it in pursuit of further information. They are thus far from a priori building blocks of human knowledge; they are quite a posteriori.

Kant proposed his theory of the forms of sensibility (space and time), as well as the forms of understanding (the categories of causality, etc.), in order to explain and somewhat justify our apparent knowledge of a material world beyond our senses, i.e. in the way of an attempt to mitigate Descartes' mind-body dichotomy and Hume's problems with induction[191]. In fact, however nice their motive, his proposals aggravated and perpetuated these philosophical difficulties.

Kant suggested, *simply because he could think of no better explanation and justification of external knowledge*, that reason molds experience in accord with these forms. According to this view, the forms of sensibility act on incoming experience in the way of a pigeonhole, and therefore of a straightjacket. But his assumption of forcible limitation naturally implied a distortion of experience by our faculties, for what is limited somewhat is necessarily twisted out of shape – i.e. it is other than it would otherwise be.

In Kant's view, if the forms did not structure the raw data provided by the senses, experience would not be at all possible. He thus pretentiously claimed to know and to tell us "*what* makes experience possible," But his theory certainly does not greatly elucidate that mystery, and it is doubtful anyone could answer such a question in sufficient detail. In any event, it is untrue that we need to know how experience arises in detail before we can at all rely on experience.

That experience is possible is given by the simple fact that it is, i.e. that we have experience. Experience is empirically given. There is no logical need for any other proof that it is possible! As for the reliability of experience, this is not something that can be proved by deductive means as a starting point. It is however

191 One of Kant's motives in formulating his doctrine of space and time seems to have been to differentiate the two phenomenal domains, the physical and the mental. But this is not truly possible, because these concepts have instances in both domains equally.

something that can be reasonably assumed to begin with, and ultimately credibly established by use of inductive logic.

The argument in favor of experience would go as follows. Experience (whether by inner or outer perception, or by intuition) is *all we have* in the way of concrete content of consciousness. *There is nothing else to refer to* – for abstractions have no existence without previous experiences, i.e. they are evidently rational *derivatives* of experience.

Our abstract knowledge is simply an attempt to report and remember relatively briefly what we have found in experience so far and to try and anticipate what may come into it later. Such knowledge is mostly tentative – i.e. it may be right or wrong – and the way we determine its validity in each case is with reference to both experience and logic.

If experience is taken phenomenologically, as mere appearance, this starting point is quite sufficient, for it in fact *assumes nothing beyond itself*. Once we have experienced something, we *know* what we experienced, and (provided we remember it and remain lucid and honest about it) we will not be fooled by fanciful abstract constructs.

There is of course a need to distinguish between different types of experience: immediate experiences (whether material, mental or spiritual), and their derivatives, viz. memories, imaginations and anticipations (all of which are mental). Such distinction is partly evident at the outset, with reference to the character and intensity of the experiences, and partly the result of later ordering in accord with inductive logic.

There is no rational realm floating in the air, above, below, before, behind or beyond the realm of experience. The rational realm is an outcrop of the realm of experience. Reason helps humans make sense of the world of experience, *after the fact*. It cannot per se affect, modify or distort experience, because experience (i.e. our experiencing) invariably precedes it.

Reason needs something to act on before it can act at all; it cannot produce experience and it has no power to affect what has already presented itself to us. Reasoning always occurs *in relation to* some given content of consciousness, in response to some occurring or occurred experience. Reasoning cannot exist

apart from some object of consciousness to reason about. This is true at all levels and in all areas of reasoning.

Consciousness per se has no phenomenal attributes, note well. It is the transparent *relation* between us (the Subjects of consciousness) and our percepts or concepts (the concrete or abstract objects or content of consciousness).

From this phenomenological ground, and the attendant deductive and inductive logical insights in accord with the laws of thought, we can gradually build up a reasonably true to experience body of knowledge. Reason is an efficacious tool of knowledge, if used with due regard to experience and logic.

Kant on the contrary believed that space and time cannot be found in or grasped from experience, and so can only be explained as impositions of specialized faculties that integrate sensations into perceptions. According to him, we cannot experience anything at all until *after* sensations have been artificially ordered in space and time by these faculties. The "forms of sensibility" thus forcibly *give form* to the sensible; and such ordering is therefore purely intuitive (in the Kantian sense of that term) and not empirical, a priori and not a posteriori.

The implication of such a viewpoint is that our notions of space and time are given and fixed, for everyone and forever. *Yet the documented history of human thought on space and time is that our notions of them are uncertain, varied and changing.* Still today, there are doubts and differences of opinion in these matters, and we continue to hope our understanding of them will further evolve.

This historical fact is sufficient proof that Kant's theory that space and time are not empirical percepts or concepts, but forms somehow imposed by our faculty of sensibility, is wrong. For, to repeat, if Kant's view were correct, there would be no change across human history in our ideas concerning space and time. We would collectively have a definite, common and static view of them. Our faculties could not adapt to changing data and yield new theories about space and time.

The truth is, our ideas in this field have evolved greatly through history, and also change as we individually grow and become more educated.

The Greek geometers and philosophers developed certain views of space and time. Zeno found certain difficulties in them. In modern times, Descartes invented coordinate geometry. Newton and Leibniz developed their differential and integral calculus. Kant's deterministic-subjectivist view was itself one stage in the historical development of these notions. Many other philosophers have since had their say on the topics of space and time, notably Husserl.[192]

Among recent physicists, Einstein proposed revolutionary ideas, which tied time to space and adopted non-Euclidean geometry for them. Gödel showed that theory left some unanswered questions[193]. Hawking and others have lately greatly affected our views, with reference to black holes and the Big Bang. And of course, string theory with its additional dimensions no doubt further complicates matters.

All that goes to show that space and time are *inductively developed* percepts and concepts. Note well that not only the concepts, but even their perceptual basis varies over time: for instance, the discovery of the constancy of the measured velocity of light (through the Michelson-Morley experiments) greatly (thanks to Einstein theory of Relativity) changed our view of space and time. If these percepts and concepts were constitutional or structural as Kant implies, they would be static and independent of all experience.

This simple historical observation demonstrates incontrovertibly the inaccuracy of Kant's mechanistic view of our knowledge of space and time. Kant's view is rightly labeled "Idealism" (though not in the sense of Plato's transcendentally existing Forms or Ideas), because it effectively divorces our percepts and

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192 We should also keep in mind that there have been reflections on these topics in the East. See for instance, 13th century Japanese Zen master Dogen's essay "The Time Being" (pp. 69-76). Kapleau, who includes part of this essay in his book, considers its insights, "realized … introspectively … through zazen" to "parallel … to a remarkable degree" modern scientific beliefs (pp. 307-11). I don't know about that, finding it difficult to understand fully. But it any case it is interesting and challenging.

193 See Yourgrau's instructive and interesting book on this topic.

concepts of space and time from experience. His theory implies that they are inventions of our faculties, i.e. ultimately equivalent to figments of the imagination, with no real relevance to or dependence on empirical data.

In my view, space and time are *partly percepts* directly given in experience, *and partly concepts* drawn by us from experience using logic (notably, the laws of thought). With regard to space: its first two dimensions are empirical facts evident through perception, while its third dimension requires additional logical work to be projected and so is more conceptual. As regards time: we do not perceive any such thing; it is entirely conceptual, though based on the perception of change. We experience phenomena in flux, and postulate time to make such change more reasonable.

More precisely put, regarding space, every *visual* experience involves spatial extension, at least in the sense of having two dimensions (though the latter characterization of space, in terms of dimensions, is a later and more conceptual development). What we call the third dimension (again, later, at a still more conceptual level) is the outcome of a rational attempt by us to make sense of certain apparent contradictions in the first two dimensions. For examples, that one thing seems to (over time) move behind or in front of another, or the effects of perspective (proximity and angle from the observer). To resolve such difficulties at the perceptual level, or interpret what we see, we introduce the third dimension, in the way of a successful inductive hypothesis.[194]

The location of auditory phenomena in space is a separate issue. The auditory phenomena are of course perceived, but their

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194 Note that we could conceivably adopt an alternative, more positivistic hypothesis, and regard things as really disappearing when they go behind others and regard things as really changing size and shape as they change distance and direction relative to us (or we do relative to them). This possible interpretation of perspectives is not favored because it is much more difficult for the individual to manage in practice, and more importantly because of the *irreconcilable contradictions* it implies between the experiences of different individuals.

placement in space is always an inductive hypothesis, sometimes right and sometimes wrong. Similarly, the precise location of our touch sensations in our body and taste sensations in our mouth depend on an *imaginary* mapping of space, *after* physical space has already been visually perceived and understood. Thus, the phenomenon of space is primarily visual and only secondarily involves the other phenomenal modalities.

Furthermore, there seems to be *two* extensions of space, one mental and one physical. These may overlap transparently, in the sense that we seem capable of projecting some mental phenomena (hallucinations) into outer space side by side with physical phenomena. Moreover, it seems evident that mental phenomena cannot exist if we have not first come into perceptual contact with physical phenomena; that is, mental phenomena rely on memories of physical ones, which by the power of imagination we manipulate (in a second stage), as we will. Thus, mental extension is in a sense *a product of* physical extension. Nevertheless, the two spaces exist, and it would be an error to speak of the one and ignore the other.

If we consider *measurement* of extensions (comparing shapes, lengths of lines, areas of surfaces, volumes of bodies), it is possible in both spaces. Such measurement is based on using some concrete thing (like a physical or imaginary ruler) as an intermediary scale, to compare one length to all others. However, mental measurement of internal or external space (the latter by a sort of hallucination) is necessarily approximate (though some people are better at such estimates than others). Physical measurement is considerably more accurate, and we have found many ways to perform it.

The mathematical science of geometry is an attempt to explain and anticipate various apparent regularities in spatial existence. But this science has a great inherent difficulty, in that its basic units of consideration, viz. points, lines and surfaces, are not empirically given, whether in mental or physical space, but require *purely verbal negative suppositions* to be adequately defined. We cannot actually see a point without any extension,

or a line or surface devoid of further thickness[195]. We have to specify by means of verbal negation what we intend concerning them. So, the points, lines and surfaces dealt with by geometrical theory are clearly and definitely concepts; they idealize percepts, but are not percepts. They are, at best, abstractions from approximate concretes; they not purely empirical objects.

All the above factors regarding space are mentioned here so as to remind us that what we call "space" has many aspects and involves many considerations. There is space in the purely *perceptual* sense, as it appears in any and all visual experiences. Visual experience without extension is inconceivable, contrary to Kant's suggestion. We could not see only a dimensionless point; and in uniform light (or even total darkness) we would still see an extended space (or void). Therefore extension (in two dimensions, to repeat) is given in experience and does not need to be as Kant suggested imposed on experience.

Moreover, there is a subsequent development of *the concept* of space, first with regard to a third dimension, second in correlation with other phenomenal modalities (sound, touch, taste), and onward using more abstract considerations. By the latter I mean: giving space a name, developing a theory of space, the notion of dimensions, evolving a geometry of space, first Euclidean and then non-Euclidean, and so forth. At an advanced stage, we realize the relativity of spatial and temporal measurements, and develop a theory of relativity, then a theory linking space and time. And the conceptualization of space goes on and on, for there are still many unsolved mysteries.

Similarly, the word time refers to many levels of consideration, from the pure perception of motion in space and qualitative changes (visual or otherwise) – to very abstract concepts and complex theories. Time is not itself perceived but largely conceived with reference to experiences of motion and mutation. Time is a concept, and not at all a percept (unlike the first two dimensions of space). Indeed, the most perceptual part of change

195 We only perceive rough approximations of those geometrical units: e.g. extended dots rather than points, and so forth. See my discussion of this in my *Phenomenology* chapters 8.2 and 8.3.

is that which is evident *now* (in the present); change occurring in the past and more so in the future requires still more conceptual means to grasp (notably reliance on memory and on imagination). Propositions have to be formulated and justified.

What is given to us in experience is motion and change; but since these seem to us to imply contradictions, we invent the concept of time to resolve the contradictions somewhat. We say: though this thing or moment differs from its predecessor or successor in my experience, there is no contradiction because they are in different positions in a "time" dimension. We thus invent time, somewhat in analogy to space, although such analogy has its difficulties, since it presents time as static rather than dynamic and fails to clearly distinguish between present, past and future.

We notice, too, that there are apparently an inner time and an outer one. That is to say, mental events call for a harmonizing concept of time just as physical events do[196]; and since these two sets of events seem to occur in separate domains, we can effectively speak of two time streams. Or eventually, perhaps, one time stream to explain both sets of events. Here again, the issue of measurement arises, using a physical clock or mental metronome (i.e. using certain standard motions or changes for comparison with others).

And here again, the concept becomes more and more abstract and complicated, as we seek to better understand it and build theories around it, and relate it to other things (like space, in the theory of relativity). Certainly, the concept of time is full of difficulties, which I need not go into here, for they are widely known. E.g. How stretched in time is the present? Where have past instances of the present gone, and where will future instances of the present come from? We hope over time we will overcome more of these epistemological and ontological

196 Note this well – it is not merely physical time that presents us with difficulties, but equally mental time. So, it cannot be argued that the difficulties are specifically physical, or specifically mental either.

difficulties and others we do not yet notice. Yet the concept of time is very useful, so we continue to use it anyway.[197]

What here should be stressed is that our concepts of space and time are built up inductively from various percepts. Inductively means using generalization and particularization, adductive logic (confirmation, rejection of theories). These concepts do not, as Kant implies, antedate and themselves form the percepts in some way. We should not confuse the formation of concepts out of percepts, with the Kantian idea that the percepts are formed out of sensations. For it is such confusion that gives Kant's theory a verisimilitude it does not deserve.

For instance, Kant's theory of space seems justified by our common belief that our eyes subdivide the light coming from a physical object, producing visual sensations that are reassembled in the brain to give us a complete image, which is what we allegedly see. But this scenario leads to logical difficulties, as discussed elsewhere. We must therefore on the contrary assume that we perceive the physical object itself, or at least the physical light from it, and not a mental image of it stored in the brain. In that case, the internal consistency of Kant's theory is too shaky, and the theory must fall.

Furthermore, we should not be overly impressed by the fact that Kant's ideas on space and time inspired new thinking in subsequent philosophy and science. Most famously, Einstein acknowledged some debt to Kant in this domain. A not-entirely-accurate viewpoint (like Kant's novel subjectivism of space and time) can still lead to correct views (like Einstein's more objectivist relativity of observations to observers). Fanciful notions can give rise to good ideas.

2. Ratiocinations

Formal logic (including both its deductive or inductive branches) analyzes and validates all sorts of components and

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197 See also my discussions of issues relating to space and time in *Phenomenology* chapters 2.4 and 6.1-6.3.

processes of human knowledge (or knowing). Looking at the totality of it, one may get the impression of a static collection of ways and means. But this is only, of course, the finished product, and we cannot claim to really understand logic till we have captured ***the many unit rational acts underlying every thought***.

This refers to the smallest building blocks of dynamic thought, which we may call ratiocinations. In formal logic, we usually think of terms, propositions and arguments as units of thought. But in fact, such units are far from primary; they are mostly complex constructs, which we may call cogitations, made by various simultaneous and successive ratiocinations.

Ratiocinations and cogitations are of course all judgmental (to use Kant's term), insofar as their truth is open to doubt or discussion to various degrees (which does not mean that they are necessarily or even usually false), in contrast to pure experience which must be taken as given (i.e. true in principle).

I suspect and suggest that when Kant formulated his theory of "pure forms," the forms of sensibility and forms of understanding, he was trying to identify the rational acts that underlie what on the surface appears to most of us as thought. His distinction between "transcendental logic… which gives an account of the origins of our knowledge as well as its relationship to objects," and "general logic… which abstracts from the conditions under which our knowledge is acquired, and from any relation that knowledge has to objects," seems to point in that direction[198].

This programme of Kant's was very interesting and laudable, although he erred in focusing directly on relatively complex concepts like space and time (which he classed as intuitions) and substance and causation (which he classed as simpler concepts), instead of on the more primitive rational acts which give rise to those concepts. The latter are admittedly close to basic; but since they can (as we shall presently make clear) be reduced to sets of the former, they are not as basic as Kant implied them to be.

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198 Here quoting from the aforementioned Wikipedia article, without my necessarily agreeing fully with this terminology or these definitions.

We wish, nevertheless, to implement Kant's good idea in its essence, and look for the true elements or irreducible primaries of reason. What are these 'ratiocinations'? They are, first and foremost, acts of reason or rational acts, from which (in various combinations, in various circumstances) all others are gradually built up. To say that they are *acts* is to mean that they are *acts of will*, volitional acts, voluntary efforts *of the subject* of rational cognition, i.e. the soul, the one who thinks.

Note well, I am not referring like Kant does to some mechanisms or structural determinants that in some mysterious and uncontrollable manner form thought out of sensory impressions (first percepts ordered in space and time, then concepts ordered by the categories); and thus present us, take it or leave it, with a finished product of doubtful logical validity or certainty. Kant's theory of knowledge makes ignorant, stupid and passive marionettes out of us, with no say over our noetic destiny. It is, as already mentioned, a self-contradictory position.

What I am saying is that the subject (i.e. you or me) is *an active agent* in the process of reasoning. It is no accident that reason and volition occur in the same biological entities – they naturally go together; they are mutually dependent faculties. They occur in individual humans in proportion to each other, because they are essential to each other's functioning[199].

The elements of reason are not cognitive "atoms;" they are not notions, ideas, concepts, and much less propositions or arguments. They are not entities, but the means through which we produce such entities; they are *cognitive events*. And they do not just occur without our participation: they are *thought by us* – they are actions *we* are called on to take to advance in our knowledge of the world by way of reason.

'Conception' refers to the act of conceiving, i.e. to the cognition of abstract relations (notably those of similarity or difference). This concept is formed by analogy and contrast to that of

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199 Higher animals may well have some (more limited or just different) rational and volitional powers too; if they do, or to the extent that they do (for I do believe they do), these powers are likewise necessarily proportional to each other.

'perception', which is cognition of concrete phenomena (and to 'intuition', which concerns non-phenomenal concretes). Abstracts relate concretes to each other but are not phenomenal or concrete objects themselves.

Conceptual insight (which in a broadened sense includes logical insights of compatibility or incompatibility) is something indeed mysterious (a 'seeing' without eyes and whose objects are invisible). It is the miraculous human capacity for understanding, our distinctive act of intelligence.

Before any verbalization in terms of common nouns is possible or meaningful, some sort of conception is necessary. For this reason, any attempt to deny the validity of conceptual knowledge as such is absurd. It is itself conceptual, so it cannot logically deny conception as such. Thus, conception as such (though not necessarily every conception) is necessarily valid.

Whereas Kant told us what he regarded as conditions of perceptions, I would here like to stress the conditions of conception. These include an intelligent Subject, with the power of volition, able to build concepts out of percepts. Reason is impossible without volition. Volition is needed to wonder, to ponder, to intend, to research, to check results, to logically evaluate hypotheses, to change one's opinion, and so forth. These are not functions that any machine-like entity can perform, but only someone with free will.

It is true that the effort involved in our simplest acts of reason is not always apparent. That is to say, much of our reasoning goes on subconsciously, indeed (for all intents and purposes) unconsciously. This might seem to confirm Kant's essentially mechanistic position. The brain does seemingly continuously feed our minds with thoughts of all kinds, whether we like it or not. And if any effort is involved, it is rather the effort needed to stop thought – a far from easy feat. Are such thoughts "ours" in any meaningful sense? Are we just passive observers of them, or intelligent doers of them?

However, we can still profess and insist that thought is essentially volitional, by pointing out how simple, easy and quick the elementary rational acts are bound to be, and how they can become reflex and habitual and so almost invisible to us.

Consciousness does not always imply self-consciousness, or consciousness of all aspects of a situation. We only become aware of our rational acts when they reach a certain level of complexity, difficulty and cumbersomeness, i.e. when an unusual, more conscious effort of thought is required of us. It is thus quite reasonable to claim that no thought is at all possible without some "presence of mind" (more precisely stated: "presence of spirit"), however minimal (or subliminal) it be[200].

This affirmation becomes all the more credible when we consider what specific acts might be listed under the heading of ratiocination. Certainly not all of Kant's pure forms, although some of them might fit the bill. Two approaches are possible to answer our question. (a) We can proactively observe the rational acts through which we gradually build up our terms, propositions and arguments, even as we do them, or (b) we can retroactively analyze the genesis of our thoughts into the simpler components to which they are reducible.

However, as we do so, it becomes obvious that we cannot dichotomize all thought into simple and complex, or ratiocination and its products. It becomes obvious that there are in fact many gradations between the simplest, irreducible rational acts and the most complex static products of these. When I first proposed a concept of ratiocination some years ago, I had in mind certain very simple rational acts; but the analytic listing below (incomplete though it be) shows that the concept must be expanded somewhat.

Some rational acts are primitive (elementary, irreducible), but others (equally important) are composed of two or more simpler rational acts. More precisely still: composite rational acts are not merely the simultaneity or succession of two primitive acts, but a combination of acts such that the second one performed depends on the results of the first one performed. It is difficult

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200 I discuss various so-called *involuntary* acts of volition throughout my work *Volition and Allied Causal Concepts*, always postulating a minimum level of consciousness for them, since they are considered acts of volition, and all will is freewill. "Involuntary" in such contexts does not mean literally "non-volitional" but more mildly *almost* so.

to label such an act primary, since it includes another primitive act; but on the other hand, it is difficult to label it secondary, since it adds something new to the preceding. The word ratiocination should therefore not be taken too rigidly, and range across simple to more complex rational acts.

Moreover, I do not here propose a precise and comprehensive list of ratiocinations, but only make suggestions of some possible candidates for the job, in the way of illustrations. We do not have to have a fixed list, but may engage in an ongoing research project, using open-minded trial and error as our method. The answer to our question is not some dogmatic neat doctrine, but a heuristic and flexible way. We do not want to fall into the trap set by Aristotle and Kant of a finite number of specified units, or of an artificially symmetrical scheme. We may propose candidates cautiously, tentatively and reversibly; we may proceed uncertainly and change our minds. We do not have to claim omniscience in such a delicate and crucial matter.

The following, then, is a brief, non-exhaustive survey of how we acquire knowledge, with reference to some of the most important rational acts or ratiocinations:

- Observation of the presence of something and its consequent *affirmation*. This is clearly a simple, primary act of reason, an acknowledgment of experience in accord with the law of identity.
- Observation of the absence of something and its consequent *denial*. This act is not quite primary, because we must first think of some sought for presence and look for it (far and wide) and not find it (thus far). It is thus an inductive activity (and so open to later revision), rather than a simple act, and it refers to the second and third laws of thought as well as the first.
- Observation is essentially a passive act, although one may observe the results of more active interventions (whether directed at the object or at the subject), called *experiments*. These, whether physical or mental, are also rational acts.
- Mentally (or more precisely, spiritually) *intending* things, and physically *pointing* at them. These rational acts serve to

tell ourselves (and each other, eventually[201]) what we mean to refer to during subsequent rational acts.

- *Distinguishing* and isolating one thing in the field of experience from others, or subdividing one thing into two or more things. This is done by mental projection, and involves imaginary drawing of boundaries, so that some aspects of the whole are considered as one thing while other aspects are considered as other thing(s).
- Making *comparisons and contrasts* of measure or degree. This involves observations of similarity and dissimilarity between things in the same field of experience or in different fields. Comparison is positive, and therefore more direct; contrast is negative, and therefore requires more processing.
- On the basis of the preceding activities, we *abstract* aspects of things from things, and then *group* together things that are similar and separately things that are dissimilar. Note that negation is an important aspect of abstraction.
- Abstraction is a crucial aspect of concept formation or conceptualization. Abstraction allows us to engage in *classification*, collecting distinct and similar things together; then developing hierarchies and orders of classes. Note that classification involves both integration and differentiation; including some things in a class implies excluding others from it[202].

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201 Note that while *one's own* "pointing" is an intention that we know intuitively, *someone else's* "pointing" is ultimately understood by inductive means, i.e. by hypothesizing what might be intended and eliminating erroneous hypotheses, with reference to the enduring or repetition of such pointing in a changing context.

202 The only classes that include everything are terms like "thing," in the sense of existent or real. Their contradictories (non-thing, etc.) are necessarily *merely verbal* fictions, i.e. essentially empty classes, in which we dump figments of our imagination that we cannot include. On this basis, we have a broader term "thing" that includes both things and non-things in the preceding sense. The value of such a broader term is that it allows us to name things that we are not yet certain about either way. That is, it has inductive value as a temporary way-station.

- After initially grouping some things together in a class, we may add on more cases, or remove some instances. These are the intentional processes of *inclusion* and *exclusion*. Such changes in subsumption are based at first on apparent similarities and differences between new and old instances.
- Eventually, efforts may be made to explicitly *define* the common and distinctive character(s) between things classed together. Sometimes definition is immediate and fixed; but usually it is gradual, tentative and adaptive. A definition may at first be vague, then become more precise.
- *Naming* a particular, or a concept that one has constructed (as above), is also a rational act. Such verbalization is not always necessary, but usually useful.
- Measurement, of course, depends on number, especially as it gets more accurate. This depends on *counting*, starting with one then two or more successively. Note that the unit is formed by distinguishing (as above detailed); some grouping may be needed; numbers greater than one depend on reiteration of addition of one.
- Also involved in measurement is the *comparison and contrast of numbers* (equal or unequal, i.e. greater or smaller). The numbers refer to entities (e.g. people or commensurable portions of a line) or to qualities (e.g. degrees of a color or speed of movement). The numbers involved may be the same, or considered approximately so; or they may different, or different enough to constitute a negation.
- Numbers also make possible *statistics*, from which we develop frequency concepts like all, some, none, few, most, through which we define the quantity and other types of modality of propositions.
- *Proposing* (i.e. formulating a proposition) categorically, then conditionally or disjunctively, are obviously complex rational acts, since they depend on many of the previously mentioned simpler acts being performed first (i.e. a proposition involves many concepts).

- Propositions are initially singular and actual, and thus by implication particular and possible. We try to *generalize* them as far as possible, and have to *particularize* them as much as necessary. These are crucial rational acts, depending on the laws of thought and the principle of induction, and on numerical concepts.
- *Asking questions and looking for answers* are rational acts, which help us advance in our conceptualizations and formulations of propositions. We make suggestions or speculations in reply, which we then must test before we can adopt or reject them.
- *Theorizing* involves not only forming concepts and propositions, but also interrelating them together and with experience by means of various arguments. Theories may consist of one proposition or large and intricate conjunctions of propositions. What most distinguishes theorizing from mere proposing, however, is the *invention of new terms*, i.e. the use of imagination.
- Frequently, we move from one abstraction to another by way of (rough or precise) *analogy*, using one conjunction of characters to construct another. This involves *imagination*, the power of reshuffling mental data at will.
- An important aspect of theorizing is the search for causes, whether in the epistemic sense of reasons (attempted explanations, premises or items of evidence), or in the more ontological senses of causatives, volitional agents or influences of various sorts. For knowledge of causes in any of these many senses is the main source of our *understanding*.
- Theories are always in flux, being constructed, modified or dismantled. If they fit in with the totality of experience and logical considerations they may be adopted; if they don't they are rejected or at least made to adapt. This is the inductive process of *adduction*, which involves complex rules of comparison and contrast between competing hypotheses.

- *Arguing*, from premises to conclusions, using inductive and deductive logical processes, like adduction or syllogism, is used to justify and clarify. Arguments are still more complex rational acts, dependent on previously formed concepts and propositions.
- Arguments, and indeed the various rational acts preceding and succeeding them, refer to *the laws of thought and the principle of induction*. This means acknowledging appearances, looking for contradictions between them, looking for solutions to problems, judging truth and falsehood, estimating probabilities.
- *Logic* may be exercised ad hoc, without using theoretical knowledge of logic, or may be applied with reference to logic theory previously developed or studied. Every insight or act of logic is of course a rational act. A movement of thought not disciplined by logic is irrational.

The above list shows many of the main rational acts involved in everyday reasoning. It is clear that the acts here listed are all deeply involved in the formation of concepts, propositions and arguments of all kinds. It is also clear that there are both inductive and deductive movements of thought in most of these various acts.

Note that some ratiocination is pre-conceptual and pre-verbal treatment of experiential data. It is distinctively aimed at perceived particulars, rather than at conceived universals. Such ratiocination prepares the ground for further thought - thought of a more conceptual variety. The latter is also composed of ratiocinations; for instance, naming is a distinct rational act, one of the many components of verbal thought.

If we analyze our rational acts closely, we find them all to be *intelligent responses to the way things appear to us*. Through them, we use given experiences to form concepts of varying complexity (for example, causation cannot be understood or known in a given case without first grasping and using affirmation, negation, classification, statistics and conditioning).

These constructs are not necessarily true in a given case, because the more complex they get the more they involve inductive assumptions (for example, assuming some negation by

generalization). Nevertheless, the simplest ones are pretty reliable because of the narrow limits of their assumptions.

Some ratiocination involves direct insight, i.e. it refers to evidence given in experience alone (e.g. affirming, on the basis of observation of presence). Some, however, is more indirect, involving some reasoning (e.g. denying, on the basis of non-observation of presence). Thus, on the whole, ratiocination appeals to *both* experience and logic, and not merely to the one or the other.

It is clear from our list that ratiocinations are necessarily volitional at some level, in conscious accord with the laws of thought. We can do them, or abstain from doing them. We can do them conscientiously and correctly; or we can fudge them, and err. We retain the capacity to think irrationally, i.e. to misuse our powers of judgment. Purely mechanical acts (such as Kant conceived for us) cannot yield valid judgments, for validity is a value judgment presupposing freedom of action and of choice. Machines or computers may of course be programmed to do as we will them to; but in such cases, it is still our judgments that are evaluated, not theirs.

Since ratiocinations, and thence all thought processes, are acts of the Subject, and the Subject is a non-phenomenal entity known only through intuition, *they cannot readily be pointed out in phenomenal terms*. We can perceive their phenomenal products in us, but the productive acts themselves can only be apperceived, i.e. known introspectively by each one of us. For this reason, it is rather difficult to pin them down publicly. We can say that they occur, but we cannot describe them in terms of something more concretely manifest than our self-knowledge. That is no doubt why many logicians tend to ignore this important field of logic. Ratiocination is too insubstantial and psychological for their liking. They prefer to dwell on more solid and verbal objects of study.

None of this material is very new within my own works, or in general. What is being emphasized here is the need to be aware of all the little rational acts that underlie the larger, more commonly studied, movements of thought. A lot of work might be done by future logicians, to expand on this list and describe

the acts involved more precisely, but we shall rest content with the present illustration. A more systematic study would ideally involve traversing the whole of formal logic in detail and noting the exact ratiocinations underlying each item in it. This field of logic could be called descriptive or generative (as against formal) logic[203].

Logic is mostly dished out to people like a menu, and a menu is of course no substitute for cooking and eating. The traditional rather static presentation is inevitable, as logic is a verbal educational tool; but we must try to keep in mind and somehow bring to the fore the more dynamic aspects, if we wish to give a true picture of logic. That is, how logic is "cooked up" by logicians and how it is "eaten up" by those who study it.

Conclusions. Some of the items we have listed are comparable to Kant's categories. For instances, the first and second ratiocinations, viz. affirmation and denial, obviously correspond to Kant's first two categories. The ratiocinations concerning numbers are related to Kant's category of quantity. The ratiocination of proposing (which is, note well, dependent on other acts) can be assimilated to Kant's categories of relation. Nevertheless, the two approaches are clearly different. Kant's categories are on the whole not as basic constituents of human knowledge as the ratiocinations are.

There is a complex scale of gradation and interplay of mutual dependencies between most of our basic concepts. Some can surely be considered as direct outcomes of primary acts of reason. But others are complex products of many and varied such ratiocinations. It would be a gross simplification to lump all basic concepts together as equal "categories," let alone assign them special powers of control over our thinking, as Kant attempted. There is no basis for considering our faculties of cognition as machine-like entities, which – using some arbitrary, possibly crazy "logic" of their own or programmed into them by nature – could well distort our experiences.

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203 Or perhaps psycho-epistemology (borrowing the term Ayn Rand coined for another purpose).

Space and time are, like substance and causation, rather basic *concepts*, which we form in quite ordinary ways by abstractions from experience. It is because we find the phenomena we experience (be they seemingly physical or mental) are extended, are changing, are seemingly constant in the midst of other changes, and are regularly conjoined and disjoined, that we form such concepts. Let us keep the horse before the cart. These concepts do not tell *us* what to think out of the blue – we make *them* what they are in accord with the way things seem to us in experience and in logic. They are tools of ours; we are not their playthings.

Furthermore, conception has many levels or degrees. At the lowest or notional level, it is produced by wordless rational acts, for instance just noticing that two things are distinctly alike in some respect and mentally classing them together on that basis. More precise measurement of the similarity may be sought. It may be decided that the items are worth not only grouping together, but also naming. Once the concept is named, it may become the object of detailed discussions. At an advanced stage, it may be more and more studied and complex theories about it may be formed.

Thus, we should not confuse the humble uses of the *wordless concepts* of space and time in particular acts of reasoning, with the grand *intellectual abstractions* and debates of physicists and philosophers about them. Similarly with regard to many of the categories. An ordinary person can properly identify a causal relation without being able to discourse on the ontological and epistemological basis of causality. If we do not keep this distinction of conceptual level in mind, we are likely to get confused about the order of things in knowledge. Kant tended to blur it.

To conclude the present essay, although Kant has been an extremely impressive and influential philosopher in the modern Western tradition, his description and critique of reason are far from credible and ought not to be taken so seriously. He was clearly in no position to criticize reason, because he evidently neither sufficiently understood its workings nor had the logical tools needed for such a task, lacking especially knowledge of the logic of paradox and that of induction.

3. Induction of Contents and Forms

It should be noted[204] that induction of the content of propositions and induction of formal relationships between them (oppositions, eductions, syllogisms, and so forth) are subject to distinct rules.

To induce a proposition of whatever form with specific *contents*, i.e. a 'material' proposition (so-called in contrast to formal propositions, whether it concerns concretes or abstracts of matter, mind or spirit), one must have *some empirical evidence* that the relation concerned occurs in at least some instances. (This is ultimately true, taking knowledge as a whole: although of course some of our particular propositions are obtained from other propositions by deduction, the information that we deduced them from must eventually be grounded in experience.) Thus, for example, a proposition like 'some swans are white' requires that we actually observe some 'white swans'. We would not ordinarily (i.e. usually, ignoring deductive intermediaries) accept the proposition that 'some swans are green [like parrots]' without having witnessed the fact. From such empirical particulars all our general knowledge is eventually derived, whether by generalization and particularization or by adductive reasoning (or by deduction from general propositions so derived).

This methodology does not apply to *formal principles*. The starting point of formal logic is the assumption that the relationship between any two forms of proposition is simple compatibility – *until and unless* they and/or their negations are shown to be incompatible in some way. Contrary to the claim of some modern logicians, we cannot "*prove* compatibility," We can show examples - but the compatibility in the examples is in fact simply assumed because no *in*compatibility is found/proved (if only by logical insight). We must be careful in this context not to place the cart before the horse. Our attitude of demanding proof is correct, and our method of adducing example(s) is

204 Addendum, 2009-10.

correct – *for content*. But for *form* – i.e. in formal logic – the procedure is the reverse: we must prove the implications rather than the non-implications.

For example, in the case of the doctrine of oppositions, the way we proceed is as follows: there exists (according to the laws of thought) only seven possible oppositions: contradictory, contrary, subcontrary, implicant, subalternating, subalternated, unconnected, it follows that when we cannot prove anything regarding the opposition between two propositional forms P and Q, we must assume them to be unconnected. Simply because: *there is nothing else for them to be*![205] We always proceed *by elimination of unproven alternatives*. We demand proof for the hard relations, not for the soft. The latter follow automatically, by virtue of our not having proven the former. That is the way logicians always proceed. To search for compatibilities is redundant, because there is no way to do it without circularity or infinity. Imagine all the propositional forms in the world now or ever: we do not have to show them all compatible before we use them. They are considered compatible until and unless we manage to show them otherwise.

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205 Likewise, if we cannot prove both that P and not-Q cannot both be true and cannot both be false, then P and Q cannot be assumed to be implicants. If we cannot prove that P and not-Q cannot both be true, then P cannot be assumed to subalternate Q. If we cannot prove that P and not-Q cannot both be false, then P cannot be assumed to be subalternated by Q. If we cannot prove both that P and Q cannot both be true and cannot both be false, then they cannot be assumed contradictory. If we cannot prove that P and Q cannot both be true, then they cannot be assumed contrary. If we cannot prove that P and Q cannot both be false, then they cannot be assumed subcontrary. If none of these underlying relations can be proved, the two propositions must be taken as unconnected.

35. SOME LC PHASE THREE INSIGHTS

Drawn from The Logic of Causation (III:2008-10), Chapters 17:1 and 24:1-2.

1. History of My Causation Research

I have been dreaming of systematizing causal logic since my teens, I think, when I first studied works on logic and philosophy.

My first book, *Future Logic* (1990), mentions the manifest modal foundations of causality and indeed the tacit causal foundations of modality, stressing that different types (or modes) of causality exist reflecting the different types of modality. And of course, knowing approximately the basic definitions of causation in terms of conditional propositions, the work done on the latter in *Future Logic* was incidentally work on the logic of causation.

Moreover, having understood the formal continuity between categorical and de re conditional propositions, and indeed between the different modes of modality (including the logical), the work done with regard to factorial induction of categoricals was also significant in the long run to induction of conditionals – and thence to that of causative propositions (which are, after all, just conjunctions of selected conditional and categorical ones).

I made some general remarks relating to causal logic in my book *Judaic Logic*, first published in 1995, showing my continuing interest.

My research efforts into the logic of causation per se started in earnest in the late 1990s, with a macroanalytic approach to the problem. My purpose then was, simply put, to clearly define all the varieties of causation (its determinations, indicative of degrees of causation), then correlate them all (oppositions, eductions) and work out all syllogistic reasoning possible between them (which necessitated the development of matricial

analysis). It was, I believe the first time anyone had ever tried so ambitious a project in this field of logic. This first phase of the research was published in October 1999 as *The Logic of Causation*. However, I soon realized that there were some problems in these initial results, and tried to improve on them in a second edition published in July 2000.

But it was by then clear that I needed to develop a much deeper and more systematic approach to obtain reliable results. It was, I think, not until the later half of 2002 that I found the time to proceed with microanalysis of causation, the second phase of my research. The massive amount of work involved was completed rather quickly, because I devoted all my time and concentration to it. By about March 2003, I was able to publish the results. This work involved very many painstaking manual 'calculations', and produced a very profound understanding of causation, which allowed me to *formally* settle some age-old difficult issues concerning it.

Thus, various "laws of causation" traditionally proposed were examined and evaluated. Criticisms of causation as such, such as those of Nagarjuna or David Hume, were rebutted. The notion of natural spontaneity used in modern quantum physics, as well as the Buddhist notion of interdependence were scrutinized and judged. And a critical analysis of J. S. Mill's proposed methodology for identifying causation was made possible. In same period, I wrote two other works which had some bearing on the understanding of causality, namely *Buddhist Illogic* (2002) and *Phenomenology* (2003).

However, even as I was completing this new phase of the research, it was clear to me that some uncertainties remained, due to the manual method of calculation used (subject in principle to human error, though all results were double-checked) and because some problems could not be solved by considering only three items. It was clear to me that a third phase of research, involving a more mechanical approach (using spreadsheets, database software or ad hoc programming) to increase reliability, and a larger scope (i.e. at least four items) to increase reliability, were needed. There and then, I started doing some work in that direction; but ran out of time, having to deal with many mundane matters.

In 2004, I devoted my time to writing *Volition and Allied Causal Concepts*, a study relevant to causation by implication. I continued thinking about causation in 2005, writing down my insights in *Ruminations*, and even made some effort to advance phase III causation research. In 2006, my time was taken up writing *Meditations*, and in 2007-8 writing *Logical and Spiritual Reflections*. The latter work including some insights relating to causality (notably in book 1, chapters 3 & 6, and book 3, chapter 11). I also made some more effort in 2008 to advance phase III research, but was soon stopped by other concerns. The year 2009 was devoted to improving my website and to creating an online bookshop to sell my books.

I first posted some phase III results in my website, TheLogician.net, in October 2009, partly to encourage myself to pursue the matter further. In January 2010, I decided to try and complete phase III – and the work done is described in the following pages.

My initial idea with regard to phase III research was to develop a computer program capable of 'calculating' the value of causative propositions and syllogisms directly from the matrix relating the items concerned[206]. Realizing that in the absence of professional help such programming was beyond my immediate capabilities, I thought instead of using database software, such as Access. I began indeed doing so, but soon realized I had difficulty visualizing the interrelationships involved, not having made use of such software for many years. I therefore decided that the best way for me to proceed was through the use of spreadsheets, namely Excel software; and this is what I did.

In the present, final chapter, I will try and provide readers with a practical guide to the logic of causation. That is, after all, the purpose of the whole exercise. This book was written over a period of many years (on and off) more as a research report than as a text book. Most readers, I assume, are not very interested in the details of how I got to such or such a result, but just want

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206 This is why I have called this phase that of Software Assisted Analysis, although of course its ultimate motive is to investigate the 4-item framework.

to learn how to reason correctly with causative propositions. The validations are more of concern to logicians. Lay people want practical guidance. Thus, do not expect here a systematic summary of all findings, but rather a highlighting of some of the main points.

2. What is Causation?

What is causation? This term refers to a concept – an abstraction through which we can order empirical facts in a way that makes them more comprehensible to us and helps us makes predictions. Like every reasonable concept, causation does indeed signify an existing fact – namely the fact that sets of two or more facts are often evidently related in the ways we call causation. Causation refers to certain observable or induced or deduced *regularities in conjunction or non-conjunction* between two or more things. By 'things' (or preferably, henceforth, 'items') here, understand any domain of existence: material, physical, bodily, mental, abstract, spiritual; any category of existent: substance, entity, characteristic, quality, change, motion, event, action, passion, dynamic, static, etc. – anything whatever.

As with all concepts, the concept of causation varies somewhat from person to person, and over time in each person. At one end of the spectrum, there are people for whom the concept of causation is a vague, subconscious notion, which often produces erroneous judgments. At the other extreme, there are those who clearly understand causation and use it correctly in their thinking. The purpose of causative logic, i.e. of the present detailed theory of causation and its relevance to thought, is to improve people's understanding and practice.

Causation can thus be defined, broadly – and more and more precisely, as our study of it proceeds. But can causation as such be 'proved' to exist? Yes, indeed. Causation relies first of all on the admission that there are *kinds* of things. For, generally, we establish causation (as distinct from volition, which is indeterministic causality) not for individual items, but for 'kinds', i.e. for sets of things that resemble each other in some way. When we say that X causes Y, we mean that instances of

the kind X are related in a certain way to instances of the kind Y.

Now note this first argument well: if there were no kinds, there would be no causation. That is, if nothing could be said to be ‘the same’ as anything else, kinds would not exist and causation could not be established. But if we claim, “Nothing is the same as anything else in any respect,” we are engaged in an inextricable self-contradiction, for that very statement is full of assumption regarding the existence of kinds. Therefore, such a claim is logically untenable, and we must admit that kinds exist, i.e. that our concepts have some empirical basis.

Now, causation refers to the *possibility or impossibility of various combinations* of things (or their negations). For example, to say that X is never found in conjunction with not-Y and that not-X is never found in conjunction with Y, is a statement of ‘complete necessary’ type of causation. We can certainly argue, regarding a particular pair of items X and Y (e.g. irrational behavior and mental suffering), as to whether or not they indeed fit in this relational format; merely asserting it as fact does not of course make it fact.

But no one can logically deny that there exist some pairs of things in this world that do indeed fit this pattern of relation. It would mean that we deny that there are possibilities and impossibilities of conjunction. Note this second argument well: if we claim, “No conjunction of things is possible,” we are saying that the conjunctions implied by this very statement are impossible; and if we claim, “No conjunction of things is impossible” we are saying that contradictions are possible. All the more so, if we claim that nothing is possible or that nothing is impossible, we are involved in logically unacceptable self-contradictions. When a thesis is self-contradictory it must be abandoned, and replaced by its contradictory thesis.

Therefore, the definitional bases of causation as such – i.e. the fact that there exists the modalities of possibility and impossibility, and thence of necessity and unnecessity – and the fact that some conjunctions in the world are bound to be related by one or the other of these modalities (nothing else is even conceivable) – are indubitable. Thus, causation, which refers to

different combinations and permutations of such modalities of conjunctions, is indubitable. There are no ifs and buts about it.

Why, then, you may ask, are the likes of David Hume or Nagarjuna, and all their modern followers and imitators, so convinced of the illusoriness of causation? The answer is that they are clearly not committed to reason or logic, but merely express their cognitive or psychological problems; or they are not very intelligent. Nagarjuna relied heavily on fallacious reasoning to support his alleged critique of causation. Hume's search for an empirically observable phenomenon of 'connection' or 'bond' was a red herring; it implied that causation is something concrete, i.e. tangible or otherwise materially detectable. No wonder he could not find it! No: to repeat, causation is an abstraction, through which we order our empirical observations and predict similar events of the same sort[207].

Hume admits as much when he defines causation as 'constant conjunction' between things. However, that definition is flawed inasmuch as it draws attention to only the positive side of causation; it ignores the crucial negative side (the constant conjunction between the negations of the things). Hume also ignores the different determinations or degrees of causation. And in attempting to 'explain away' causation by referring it to habitual associations of ideas, he contradicts himself – since such explanation is itself an appeal to causality; i.e. it purports to tell us 'why' we assume causation. Causation is formally the same whether it is assumed to occur in the material surrounds or in the mind, i.e. whether it correlates things or ideas. The fact that causation is usually induced by means of generalizations does not allow us to equate it to association of ideas. And

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207 To give an example: a subcategory of causation in physics is the concept of 'force'. This is in no way thought of as something substantial – yet we consider it to be a reliable scientific reference, because it is an abstract inductive postulate through which we are able to order and predict various physical phenomena. Even if a particle theory of force is developed, it depends on the causative understanding that such particles obey certain abstract laws of behavior.

anyway, association of ideas can occur even where causation is doubted; so, these concepts cannot be the same in our minds.

As shown above, the concept of causation rests on two pillars, two fundamentals of human knowledge. The one is the fact of similarity and the other is the fact that conjunctions may be possible or impossible.

You can deny that two or more particular objects are similar, but you cannot deny that there are somewhere similar objects and that we are able to identify them in principle. You can deny that two or more particular objects are sometimes or never conjoined, but you cannot deny that there are somewhere objects that are sometimes or never conjoined and that we are able to identify them in principle. When I say: “you cannot deny,” I mean you cannot do so without self-contradiction – i.e. you cannot do so with the sanction of logic, i.e. you do so against logic.

Ontologically, causation occurs because *not* everything is possible in the world. If nothing was impossible, everything could proceed every which way. The limitations that exist in Nature constitute obstacles in its free flow, and ‘force’ it to flow along specific routes. Nature’s course is determined by where it cannot go, rather than by where it must go. The stream of events follows the groove formed by the limits set.

There are as many modes of causation as there are modes of modality. Rational argument refers to the logical (*de dicta*) mode of causation. Extensional causation is based on extensional modality. Natural, temporal and spatial causation likewise are based on these (*de re*) modes of modality. It is logically inconsistent to admit one mode of causation (e.g. the logical) and refuse to admit the others (e.g. the natural mode). There is formally no reason to discriminate between them.

In conclusion, causation is a mental overlay through which we order observed reality. But this overlay does not force reality into any arbitrary patterns; it is not an invention of ours. It is merely an acknowledgement that certain patterns do observably occur, and our task in causative reasoning is to identify when they do occur as well as possible. The overlay is not a distortive filter or a hindrance to knowledge. It is based on experience of the world and helps us to more correctly and profoundly discern

and understand the world, and thus also to better predict and deal with it.

The concept of causation has no doubt a long history, dating from the beginnings of humanity, if not earlier still in its wordless animal ancestors. Certainly, the moment our ancestors thought or said “because…” or “therefore…” they displayed their belief in or knowledge of causation. The *study of* the concept is a much later development, of course, which coincides no doubt with the dawning of philosophy, especially in ancient Greece. But it is, I think, in modern times that people began to look for applications of causation in a very conscious manner. I refer of course to the advent of modern experimental science in Europe.

Two important philosophical figures in this context were Francis Bacon and John Stuart Mill. Not because they discovered causation theoretically or the ways to find it in practice, but because they sought to verbalize causative logic. However, neither of these thinkers asked all the right questions or gave all the right answers. Surprisingly, no one made a big effort to follow up on their work, discouraged perhaps by the skepticism instilled by David Hume. It is not until the present study of causation that we have a full analysis and practical guide to causative reasoning, a truly formal logic of causation. This is really a historic breakthrough.

3. How is Causation Known?

We have in the previous section explained that causation is an ‘abstract fact’ and established that it is knowable by humans. Our definitions of the various types and degrees of causation provide us with **formal criteria** with which we are able to judge whether causation is or is not applicable in given cases. But to affirm that causation *as such* is definable and knowable does not tell us just how to know it *in particular cases*.

Can we perceive causation? Not exactly, since it is not itself a concrete phenomenon but an abstract relation between concrete phenomena (and more broadly, other abstractions). It has no

visual appearance, no color, no shape, it makes no sound, and it cannot be felt or tasted or smelled. It is an object of conception.

Can it then be known by direct conceptual 'insight'? This might seem to be the case, at first sight, before we are able to introspectively discern our actual mental processes clearly. But eventually it becomes evident that causation must be based on concrete experience and logical process. We cannot just accept our insights without testing them and checking all the thinking behind them. The foundation of causative knowledge – i.e. of knowledge about causation between actual things – is evidently induction.

That is to say, quite common and ordinary processes like generalization and particularization or, more broadly, adduction (the formulation and empirical testing of hypotheses). These processes are used by everyone, all the time, though with different degrees of awareness and carefulness. The bushman who identifies the footprints he sees as traces of passing buffalo is using causative logic. And the scientist who identifies the bandwidth of rays emanating from a certain star as signifying the presence of certain elements in it is using the same causative logic. The bushman is not different from or superior or inferior to the scientist. Both can make mistakes, if they are lazy or negligent; and both can be correct, if they are thorough and careful.

How is a given causative relation induced? Take for instance the form "X is a complete cause of Y," This we define as: "If X, then Y; if not X, not-then Y; and X and Y is possible," How can these propositions be established empirically? Well, as regards "X and Y is possible," all we need is find one case of conjunction of X and Y and the job is done. Similarly for "if not X, not-then Y;" since this means "not-X and not-Y is possible," all we need is find one case of conjunction of not-X and not-Y and the job is done.

This leaves us with "If X, then Y" to explain. This proposition means "X and not-Y is impossible," and we cannot by mere observation know for sure that the conjunction of X and not-Y never occurs (unless we are dealing with enumerable items, which is rarely the case). We must obviously usually resort to

generalization: having searched for and never found such conjunction, we may reasonably – until and unless later discoveries suggest the contrary – assume that such conjunction is in fact impossible. If later experience belies our generalization, we must of course particularize and then make sure the causative proposition is revised accordingly.

Another way we might get such knowledge is more indirectly, by adduction. The assumption that “X and not-Y is impossible” might be made as a consequence of a larger hypothesis from which this impossibility may be inferred. Or we may directly postulate the overall proposition that ‘X is a complete cause of Y’ and see how that goes. Such assumptions remain valid so long as they are confirmed and not belied by empirical evidence, and so long as they constitute the most probable of existing hypotheses. If contrary evidence is found, they are of course naturally dropped, for they cannot logically continue to be claimed true as they stand.

Another way is with reference to deductive logic. We may simply have the logical insight that the items X and not-Y are incompatible. Or, more commonly, we may infer the impossibility of conjunction – or indeed, the whole causative proposition – from previously established propositions; by eduction or syllogism or hypothetical argument or whatever. It is with this most ‘deductive’ source of knowledge in mind that the complex, elaborate field of causative logic, and in particular of causative syllogism, is developed. This field is also essential to ensure the internal consistency of our body of knowledge as a whole, note well.

Additional criteria. It should be added that though causation is defined mainly by referring to various possibilities and impossibilities of conjunctions – there are often additional criteria. Space and time are two notable ones. Two events far apart in space and time may indeed be causatively related – for example, an explosion in the Sun and minutes later a bright light on Earth. But very often, causation concerns close events – for instance, my eating some food and having a certain sensation in my digestive system. In the both these cases, the effect is temporally after the cause. In the latter case, unlike the former, the cause and effect are both ‘in my body’.

Between the Sun's emission of light and its arrival on Earth, there is continuity: the energy is conserved and travels through all the space from there to here, never faster than the speed of light, according to the theory of relativity. But what of recent discoveries (by Nicolas Gisin, 1997), which seem to suggest that elementary particles can affect each other instantly and at a large distance without apparent intermediary physical motion? Clearly, we cannot generalize in advance concerning such issues, but must keep an open mind – and an open logic theory. Still, we can say that in most cases the rule seems to be continuity. When we say: 'bad food causes indigestion', we usually mean that it does so 'within one and the same body' (i.e. not that my eating bad food causes you indigestion).

As regards natural causation, we can formulate the additional criterion that the cause must in fact precede or be simultaneous with the effect. But this is not a universal law of causation, in that it is not essential in logical and extensional causation. In the latter modes, the causative sequence may be reversed, if it happens that the observer infers the cause from the effect. Although, we might in such cases point out another temporal factor: when we infer (even in cases of 'foregone conclusion'), we *think of* the premises before we think of the conclusions. That is to say, there are two temporal sequences to consider, either or both of which may be involved in a causal proposition: the factual sequence of events, and the sequence of our knowledge of these events.

Similarly, quantitative proportionality is often indicative of causation; but sometimes not. Although it is true that if the quantity of one phenomenon varies with the quantity of another phenomenon, we can induce a causative relation between them; *it does not follow* that where no such concomitant variation (to use J. S. Mill's term) is perceived, there is not causation. In any case, the curve quantitatively relating cause and effect may be very crooked; 'proportionality' here does not refer only to simple equations, but even to very complicated equations involving many variables. In the limit, we may even admit as causative a relation for which no mathematical expression is apparent. An example of the latter situation is perhaps the quantum mechanics finding that the position and velocity of a

particle cannot both be determined with great precision: though the particle as such persists, the separate quantities p and v are unpredictable (not merely epistemologically, but ontologically, according to some scientists) – which suggests some degree of natural spontaneity, in the midst of some causative continuity.

Thus, we *must* stick to the most general formulations of causation in our basic definitions, even as we admit there may be additional criteria to take into consideration in specific contexts. It follows from this necessity that we can expect the logic of causation certain inferences (like conversion, or those in second and third syllogism) where what is initially labeled a cause becomes an effect and vice versa. Keep this in mind[208].

Laws of causation. We should also here mention the cognitive role of alleged laws of causation. We have already briefly discussed laws relating to space and time.

In times past, it seems that some degree of sameness between cause and effect was regarded as an important law of causation. Upon reflection, the proponents of this criterion for causation probably had in mind that offspring have common features with their parents. But apparently, some people took this idea further and supposed that the substance (and eventually some other characteristics) of cause and effect must be the same. But though this criterion may be applicable to biology or other specific domains (e.g. the law of conservation of matter and energy in physics could be so construed), it is not generally regarded as universal. Formally, I see no basis for it.[209]

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208 It is interesting to note here that J. S. Mill's definitions of causation use the expression: "*is the effect, or the cause*" – meaning he had in mind the general forms.

209 If we want to go more deeply in the history of 'laws of causation', we would have to mention, among others, the Hindu/Buddhist law of karma, according to which one's good and bad deeds sooner or later have desirable or undesirable consequences, respectively, on oneself. It is the popular idea that 'what goes around must come around'. Though I would agree this is sometimes, frequently or even usually empirically true, we must admit that it does not always seem confirmed by observation – so it is at best a hopeful generalization (to a life after this one) intended to have positive moral influence. In any case, I see no formal basis for it. The same can be said concerning

The law of causation most often appealed to (at least in Western thought) is that 'everything has a cause'. But though it is evidently true of most things that they have causes, and the belief in this law often motivates us to look for or postulate causes (i.e. even if none is apparent, we may assume one to exist), we have not in our study found any *formal* grounds to affirm such a law as universal. Admitting the fact of causation does not logically force us to admit its universality. This does not prove that it is not empirically universal; and it does not prevent us from formulating such universality as an adductive hypothesis. In any case, today, as evidenced by quantum physics and big-bang cosmogony, it seems generally assumed by scientists that this law is indeed not universal (which does not mean it is not very widely applicable).

I wonder anyway if it was ever really regarded as universal. I would say that in the 19^{th} Century, this law was assumed universal for physical phenomena – but not necessarily for mental phenomena; human volition was generally taken to be an exception to the rule, i.e. freedom of the will was acknowledged by most people. Paradoxically, in the iconoclastic 20^{th} Century, while the said law of causation was denied universality for material things, every effort was made to affirm it as regards human beings and thus forcefully deny freedom of the will[210]. Intellectual fashions change, evidently. But as far as I am concerned, while I admit the possibility that this law may not-be

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reward or punishment by God – though it might well be true, it is not something that can readily be proved by observation or by formal means; an act of faith is required to believe in it (I do, on that basis). In any case, the latter can hardly be called a 'law of causation', since the free will of God is thought to be involved in bringing about the effect.

210 Actually, both these changes were (I suggest) consciously or subconsciously motivated by the same evil desire to incapacitate mankind. Their proponents effectively told people: "you cannot control matter (since it is ultimately not subject to law) and you cannot control yourself (since you have no freewill) – so give up trying," People who believed this nonsense (including its advocates) were *influenced* by it to become weaker human beings. Virtue was derided and vice was promoted. We see the shameful results of this policy all around us today.

universally true of matter, I have no doubt that it is inapplicable to the human will[211].

Another alleged law of causation that should be mentioned here (because of the current interest in it, in some circles) is the Buddhist notion that 'every thing is caused by everything'. As I have shown in the present volume, this idea of universal 'interdependence' is logically untenable. It is *formally* nonsensical. Indeed, if you just think for a moment, you will realize (without need for complex formal analysis) that to affirm interdependence is to deny causation, or at least its knowability. Every concept relies on our ability to distinguish the presence and absence of the thing conceived; if it is everywhere the same, it cannot be discerned. I think the Buddhist philosopher Nagarjuna can be said to have realized that; and this would explain why he ultimately opted for a no-causation thesis. However, that does not mean that causation can logically be denied: as already explained earlier, it cannot.

Well, then. Are there any 'laws of causation'? Of course, there are, a great many! Every finding concerning the formal logic of causation in this volume is a law of causation, a proven law. For instance, the fact that not all positive causative syllogisms yield a positive conclusion of some sort is an important law of causation, teaching us that a cause of a cause of something is not necessarily itself a cause of that thing.

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211 I argue this issue elsewhere, in my *Volition and Allied Causal Concepts*. It should be mentioned that an analogue to the law of causation is often postulated, consciously or not, for the mind. We tend to think that every act of volition has a cause, in the sense of *being influenced or motivated*, by something or other. Though largely true, this assumption taken literally would exclude purely whimsical volitions; thus, I tend to doubt it, for reasons explained in my said book. In any case, do not confuse this 'law of influence' with the 'law of causation' here discussed. These are very distinct forms of causality, which cannot be lumped together.

36. The Existential Import Doctrine

Drawn from A Fortiori Logic (2013), Appendix 7:2.

1. Existential Import

A term is, nowadays, said to have ‘existential import’ if it is considered to have existing referents; otherwise, it is said to be ‘empty’ or a ‘null class’. For examples, ‘men’ has existential import, whereas ‘dragons’ does not. This concept is considered original and important, if not revolutionary, in modern symbolic logic; and it is often touted as proof of the superiority of that school over that of classical formal logic. We shall here examine and assess this claim. As we shall see, although the concept has some formal basis, it is in the last analysis *logically trivial and cognitively not innocuous*.

The founder of formal logic, Aristotle, apparently did not reflect on the issue of existential import and therefore built a logical system which did not address it. The issue began to be raised in the middle ages, but it was not till the latter half of the nineteenth century that it acquired the importance attached to it today by modern logicians.

2. Aristotle’s Teaching

Based on Aristotle’s teaching, classical formal logic recognizes six basic categorical forms of proposition: the general affirmative, “All S are P” (A), which means that each and every S is P; the general negative, “No S is P” (E), which means that each and every S is not-P; the particular affirmative, “Some S are P” (I), which means that each of an indefinite number (one or more) of S is P; the particular negative, “Some S are not P” (O), which means that each of an indefinite number (one or more) of S is not-P; and the singular affirmative, “This S is P”

(R), and the singular negative, "This S is not P" (G), which refer to a specifically pointed-to or at least thought-of individual instance. Note that general (also called universal) propositions and particular propositions are called plural, in contradistinction to singular ones[212]. The labels A, E, I, O, R and G come from the Latin words *AffIRmo* and *nEGO*; the first four are traditional, the last two (R and G) were introduced by me years ago[213].

The symbols S and P stand for the subject and predicate. The verb relating them is called the copula, and may have positive (is or are) or negative (is not or are not) polarity[214]. In the present context, the copula should be understood very broadly, in a *timeless* sense[215]. When we say 'is' (or 'is not') we do not mean merely "is (or is not) *now*, at this precise time," but more broadly "is (or is not) *at some time*, in the past and/or present and/or future." The expressions 'all', 'some' and 'this' are called quantities. Obviously, the general 'all' covers every single instance, including necessarily 'this' specific instance; and 'all' and 'this' both imply the particular 'some', since it indefinitely includes 'at least one' instance. The 'oppositions' between the six forms, i.e. their logical interrelationships, are traditionally illustrated by means of the following 'rectangle of oppositions':

212 Singular propositions are often called particular, but this usage is inaccurate, since they refer to an indicated individual.

213 One can remember these six labels by means of the phrase ARIEGO.

214 What I have called 'polarity' is traditionally called 'quality', but the latter term is inaccurate and confusing and should be avoided.

215 This approach allows us to momentarily ignore the issue of modality, and reflects common usage in many contexts. A fuller treatment of categorical propositions must of course deal with modality; I do that in my earlier work, *Future Logic*.

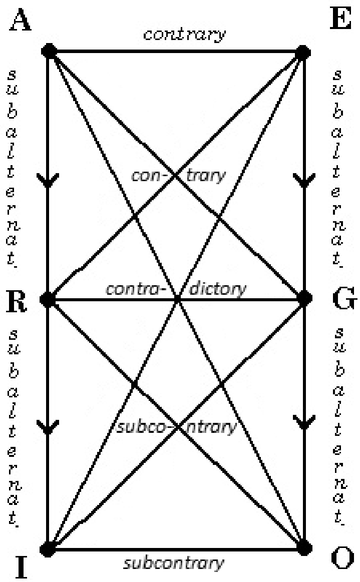

Diagram 36.1 – Aristotelian oppositions

Although Aristotle did not, to our knowledge, represent the oppositions by means of such a diagram, we can refer to it as a summary his views. It is taken for granted that, on the positive side A implies R and R implies I (so, A implies I), and on the negative side E implies G and G implies O (so, E implies O), although these implications cannot be reversed, i.e. I does not imply R or A, and R does not imply A, and so forth. This is called subalternation[216]. The core opposition in this diagram is the contradiction between R and G; from this assumption, and the said subalternations, all else logically follows[217]. A and O are

216 The implying proposition being called the subalternant and the implied one the subaltern, and the two being called subalternatives.

217 If A is true, then R is true, then G is false, then E is false; whence, the contrarieties shown on the diagram. If I is false, then R is false, then G is true, then O is true; whence, thus the subcontrarieties shown. Since R and G are incompatible (cannot both be true) and exhaustive (cannot both be false), it follows that A and O, and likewise

contradictory, and so are E and I; A and E, A and G, E and R, are pairs of contraries; I and O, I and G, O and R, are pairs of subcontraries. Two propositions are contradictory if they cannot be both true and cannot be both false; they are contrary if they cannot be both true but may be both false; they are subcontrary if they may be both true but cannot be both false.

3. Modern Modifications

Shockingly, the above traditional interpretation of the basic categorical forms (Diagram 36.1) has in modern times been found to be problematic. The above listed propositions are not as simple as they appear. The form "Some S are P" (I) means "Something is both S and P," while the form "All S are P" (A) means "Something is both S and P, and nothing is both S and not-P;" similarly, the form "Some S are not P" (O) means "Something is both S and not-P," while the form "No S is P" (E) means "Something is both S and not-P, and nothing is both S and P." Seeing the forms I, A, O, E, in this more detailed manner, we can understand that A implies I since I is part of A (and likewise for E and O), but then we realize that A and O are not truly contradictories (and likewise for E and I).

The exact contradictory of "Something is both S and not-P" (O) is "Nothing is both S and not-P" (i.e. only part of A, with no mention of its I component) and the exact contradictory of "Something is both S and P, and nothing is both S and not-P" (A) is "Nothing is both S and P, and/or something is both S and not-P" (i.e. a disjunction including O, but also E). Note this well[218].

E and I, whose instances overlap somewhat, must be contradictory, since, if they were both true or both false, R and G would in at least one case be accordingly both true or both false (this is proof by exposition).

218 The Kneales propose a similar analysis of the problem in *The Development of Logic*, chapter II, section 5. Further on (on p. 211), they say that Peter Abelard "should have the credit of being the first to worry about the traditional square of opposition, though he did not work out all the consequences of the change he advocated."

It should be pointed out that "All S are P" (A) can be defined more briefly as: "Something is S, and nothing is both S and not-P;" for given this information, it follows logically that the things that are S are P (for if this was denied, it would follow that some things are both S and not-P), Similarly, "No S is P" (E) can be defined more briefly as: "Something is S, and nothing is both S and P," without need to specify explicitly that "Some things are both S and not-P." Thus, all four forms A, E, I, O, imply, or presuppose (which is logically the same), that "some S exist(s)." Also, the positive forms, A and I, imply that "some P exist(s)." On the other hand, the negative forms, E and O, do not imply that "some P exist(s)," since the negation of a term is not informative regarding its affirmation[219].

Thus, in the above diagram, the diagonal links between the corners A and O, and between E and I, should not be contradiction but contrariety. For, while to affirm one proposition implies denial of its opposite, to deny one proposition does not imply affirmation of the other. To remedy this real problem of consistency, modern logicians have proposed to *redefine* the general propositions A and E as the exact contradictories of O and I, respectively. That is to say, the new meaning of A is only "Nothing is both S and not-P" and the new meaning of E is only "Nothing is both S and P." It follows from this measure that A (in its new, slimmer sense) no longer implies I, and likewise E (in its new, slimmer sense) no longer implies O. This redefinition of symbols A and E can, to my mind, lead to much confusion. In my view, it would be better to *re-label* the forms involved as follows:

- Keep the traditional (old) labels A and E without change of meaning; i.e. old A = A, old E = E.
- Label the modern (new) senses of A and E as respectively not-O and not-I.

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219 We could say that nothing in the world is conceivably P, without affecting the truth of "Some S are not P" or "No S is P." Clearly, in the special case where "nothing is P," the latter propositions are true for any and every value of S.

- That is, new ‘A’ = not-O ≠ old A. Whereas, old A = new ‘A’ plus I = I and not-O.
- Likewise, new ‘E’ = not-I ≠ old E. Whereas, old E = new ‘E’ plus I = O and not-I.

Thus, when we say A or E in the present paper, we mean exclusively the traditional A and E; and when we wish to speak of the modern ‘A’ and ‘E’ we simply say not-O and not-I, respectively. Note this convention well[220]. Actually, such propositional symbols are effectively abandoned in modern logic and the propositions are expressed by means of a symbolic notation, including the existential and universal quantifiers, ∃ (there exists) and ∀ (for all), respectively; but we do not need to get into the intricate details of that approach here, because we can readily discuss the issues of interest to us in plain English. Now, let us consider the formal consequences of the above findings in pictorial terms.

One way for us to solve the stated problem is to merely modify the traditional rectangle of oppositions, by showing the diagonal relationships between A and O and between E and I to be contrariety instead of contradiction; this restores the traditional diagram’s consistency, even if it somewhat dilutes its force (Diagram 36.2). Another possibility, which is the usual modern reaction, is to change the top two corners of the rectangle to not-O and not-I, instead of A and E respectively; this allows us to retain the contradiction between diagonally opposed corners, although now the lateral relation between the top corners is unconnectedness instead of contrariety, and the vertical relations in the upper square are unconnectedness instead of subalternation (Diagram 36.3).[221]

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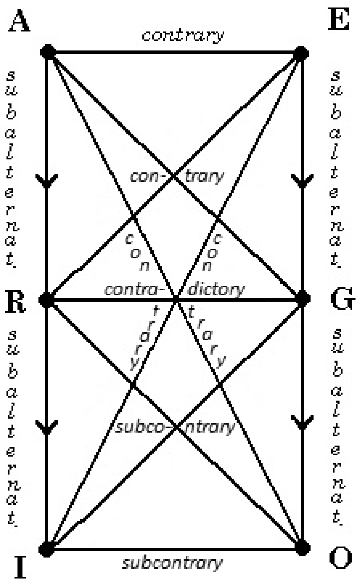
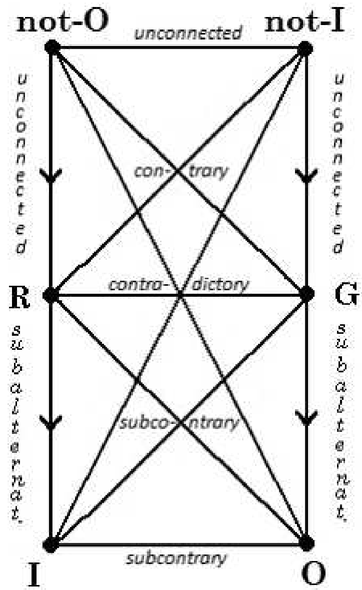
220 Of course, we could introduce modified symbols for the new A and E, such as A' and E', but I prefer to stress their underlying meanings, viz. not-O and not-I. In my view, it is dishonest and misleading to redefine the symbols A and E *themselves* as meaning only not-O and not-I. This is like a hostile takeover, permanently blocking further reflection and debate.

221 A third possible approach is, of course, to draw a rectangle with A and E in the top two corners, and not-E and not-A (instead of I and O) in the bottom two corners. In that case, it is the lower square



36.2 – modified traditional



36.3 – modern version

Notice that the lower square of the modern version is unchanged. This is due to the judgment that the forms I and O, i.e. “Something is both S and P” and “Something is both S and not-P,” both imply that “some S exist” (or “some things are S” or “there are things which are S”) meaning that if they are true, their subject ‘some S’ has existential import. Moreover, in the case of I, the predicate P is also implied to have existential import, since it is affirmed; but in the case of O, the predicate P is not implied

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that would suffer changes, with not-E and not-A as unconnected to each other and to R and G respectively. This possibility is however not very interesting, as the forms not-E and not-A are disjunctive. That is, not-E = not-(O and not-I) = not-O and/or I; and not-A = not-(I and not-O) = not-I and/or O. Note that this position is historically found in Peter Abelard, who insisted on distinguishing between “Not all S are P” (not-A) and “Some S are not P” (O), and who apparently denied that “No S is P” (E) implies anything to be S let alone P (even while regarding “All S are P” (A) as implying that something is S); see Kneales, p. 210.

to have existential import, since it is merely denied. Until now, note well, we have not mentioned the issue of existential import in our formal treatment. Now, it comes into play, with this interpretation of particular propositions.

The same applies to R and G – their subject ‘this S’ has existential import, whereas the predicate P has it if affirmed but lacks it if denied. On the other hand, since not-O (as distinct from A) is a negative statement, i.e. means “Nothing is both S and not-P,” it has no implication of existential import. Similarly, since not-I (as distinct from E) is a negative statement, i.e. means “Nothing is both S and P,” it has no implication of existential import. Clearly, if not-O was thought to be contrary to not-I, then if not-O were true, it would imply the negation of not-I, i.e. it would imply I; but this being erroneous, not-O and not-I cannot be contrary, i.e. they must be unconnected. Similarly, if not-O was assumed to imply R, it would then imply I, since R still implies I; therefore, not-O must also be unconnected to R; and similarly for not-I and G. On the other hand, not-O remains contrary to G, since if not-O is true, then O is false, in which case G must be false; similarly as regards not-I and R.

It is now easier to see why the traditional rectangle of oppositions (36.1) seemed right for centuries although it was strictly-speaking wrong. It was tacitly assumed when drawing it that the subjects of general propositions *always* have existential import, i.e. imply that “some S exist (s).” *When this condition is granted*, then in combination with it not-O becomes A and not-I becomes E, and A implies I and E implies O, and A exactly contradicts O and E exactly contradicts I – in other words we happily return to the original rectangle of oppositions (36.1). The problem is that this condition is *not* always satisfied in practice. That is, not-O or not-I can occur without their subject S having existential import.

Effectively, the forms “Nothing is both S and not-P” (not-O) and “nothing is both S and P” (not-I) signify conditional propositions (“Whatever is S, is P” and “Whatever is S, is not P”) which, without the minor premise “this is S,” cannot be made to conclude “this is P” or “this is not P” (respectively). In other words, they record a ‘connection’ between an antecedent and a consequent, but they have no ‘basis’, i.e. they contain no

information affirming the antecedent, and thence the consequent. Obviously, if that information is provided, the condition is fulfilled and the result follows. Once we realize that *the traditional rectangle remains true in the framework of a certain simple condition (viz. that some S exist)*, we see that its hidden 'inconsistency' is not such a big problem for formal logic.

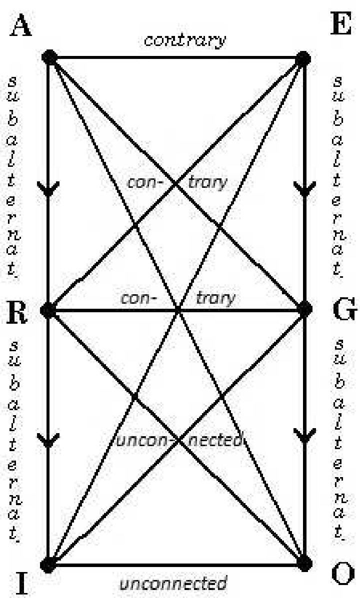
It is interesting to also consider the significance of the above revisions in the field of eduction (i.e. immediate inference). Whereas A, which implies I ("Some S are P"), is convertible to "Some P are S" – not-O, which does not imply I, is *not* so convertible. Also, whereas not-I is convertible to "No P is S," since "Nothing is S and P" and "Nothing is P and S" are equivalent and have no implication of existential import for S or P – E is *not* likewise unconditionally convertible, since in its case even if we are given that "some S exist" we cannot be sure that "some P exist" (but only that "some not-P exist"). Note well, just as O does not imply predicate P to have existential import, since it merely negates it, so is it true for E; therefore, the traditional conversion of E is really only valid conditionally. We can also look into the consequences of the above revisions in the field of syllogistic reasoning; the main ones are pointed out further on.

4. Further Review

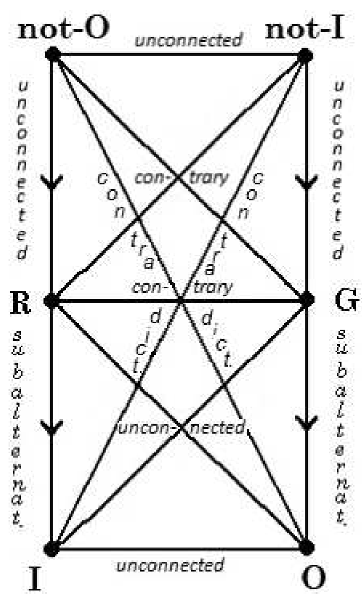
Let us now go a step further in the possible critique of Aristotelian oppositions, and suggest that *all* terms may be denied to have existential import, whatever the forms they occur in, and whatever their positions therein. That is to say, not only the subjects of general propositions, but even the subjects of singular or particular propositions might conceivably lack existential import. Although R and G, and I and O, do formally imply that some S exist(s), it is still possible to deny them in pairs without self-contradiction. That is, R and G cannot be claimed strictly-speaking contradictory, because if "this S exists" is false then they are both false; this means that their traditional relation of contradiction is valid only conditionally (i.e. provided "this S exists" is true) and their absolute relation

is in truth only contrariety. Similarly, I and O are only relatively subcontrary and their unconditional relation is really unconnectedness.

Indeed, it happens in practice that we reject a singular subject altogether, when we find that some predicate can be both affirmed and denied of it. This is dilemmatic argument: finding both that 'this S' is P and that it is not P, we must conclude that either one of these predications is wrong, or both are wrong because 'this S' does not exist. Particulars, of course, do not necessarily overlap; but if we can show by other means that "no S exists," we can be sure that neither the set of S referred to by I nor that referred to by O exist, and thus deny both propositions at once. Granting all this, the above diagrams (36.2 and 36.3) can be *further* modified as follows:



36.4 – re-modified traditional



36.5 – modified modern version

In both these diagrams (36.4 and 36.5), all relations are the same as before, except the one between R and G (contrariety), and those between R and O, G and I, and I and O (which are now

unconnected pairs). Notice that in the second diagram (36.5), although R and G are no longer contradictory, the pairs not-O and O, and not-I and I, remain contradictory, since if we deny that "Something is both S and P" (I) on the basis that "No S exists," we can all the more be sure that "Nothing is both S and P" (not-I), and likewise regarding O and not-O.

5. Reassessment

We have thus proposed two successive dilutions (weakening revisions) of the traditional rectangle of oppositions. In the first, we followed modern logic in no longer assuming with Aristotle that the subjects of universal propositions have existential import. In the second, we went further and additionally denied that singular and particular propositions may well lack existential import. Clearly, if our goal is to formulate an absolute logic, one applicable equally to propositions with existential import and those without, the successive dilutions of the Aristotelian diagram are justified and important. But are such logics of anything more than academic interest – are they of practical interest? The answer must clearly be no, as I will now explain.

A difficulty with the ideas of existential import and emptiness is immediately apparent: these are characterizations that may be true or false. Different people at the same time, or the same person at different times, may have different opinions as to the existential import or emptiness of a certain term. Some people used to think that dragons exist, and maybe some people still do, yet most people today think dragons never existed. So, these characterizations are not obvious or fixed. Yet modern logicians present the question of existence or non-existence as one which has a ready answer, which can be formally enshrined. They fail to see that the issue is not formal but contentual, and thus in every given material case subject to ordinary processes of testing and eventual confirmation or disconfirmation.

It follows that the issue of existential import is not as binary as it is made out to be. The issue is not simply existence or non-existence, as modern logicians present it. The issue is whether at

a given time we know or not that existence or non-existence is applicable to the case at hand. A term with existential import may be said to be 'realistic', in that it refers (or is believed to refer) to some existing thing(s). An empty term, i.e. one without existential import, may be said to be 'unrealistic', in that it refers (or is believed to refer) to a non-existent thing. In between these two possibilities lies a third, namely that of 'hypothetical' terms, for which we have *not yet* settled the issue as to whether they are (in our opinion) realistic or unrealistic. Moreover, this third possibility is not monolithic like the other two, but comprises a host of different degrees.

Our knowledge is mostly based on experience of physical and mental phenomena, though also on logical insights relating to such experience. Roughly put, we would regard a term as realistic, if we have plentiful empirical evidence as to the existence of what it refers to, and little reason to doubt it. We would regard a term as unrealistic, if we have little empirical evidence as to the existence of what it refers to, and much reason to doubt it. And we would regard a term as hypothetical if we are thus far unable to decide whether it should be characterized this way or that. In any case, the decision is usually and mostly inductive rather than purely deductive as modern logicians effectively imagine it.

How are terms formed? Very often, a term is formed by giving a name to a circumscribed phenomenon or set of phenomena that we wish to think about. Here, the definition is fixed. More often, a term is applied *tentatively* to a phenomenon or set of phenomena, which we are not yet able to precisely and definitively circumscribe. In such case, we may tentatively define it and affirm it, but such a term is still vague as well as uncertain. Over time we may succeed in clarifying it and making it more credible. Here, the definition is variable. Thus, the formation of terms is usually not a simple matter, but *an inductive process* that takes time and whose success depends on the logical skills of the thinker(s) concerned.

Of course, as individuals we mostly, since our childhood, learn words from the people around us. This is effectively fixed-definition terminology for the individual, even if the term may have been developed originally as a variable-definition one. In

this context, if we come across an obscure ready-made term, we cannot understand it till we find some dictionary definition of it or someone somehow points out for us the referent(s) intended by it. But even then, inductive acts are needed to understand the definition or the intent of the pointing. When you point at something, I cannot immediately be sure exactly what it is you are pointing at; I may have to ask you: ‘do you mean including this, excluding that?’ and thus gradually zero in on your true intent.

Each of us, at all times, retains the responsibility to judge the status of the terms he or she uses. The judgment as to whether a term is realistic, or unrealistic is not always easy. *In practice, therefore, most terms are effectively hypothetical*, whether classed as more probably realistic or more probably unrealistic. Even so, some terms are certainly realistic or unrealistic. All terms that are truly based exclusively on empirical evidence or whose denial is self-contradictory are certainly realistic, and all manifestly counterfactual or self-contradictory terms are certainly unrealistic. So, all three of these characterizations are needed and effective.

Let us suppose the formation of realistic terms is obvious enough, and ask how imaginary ones are formed. Imaginary terms are not formed ex nihilo; they are formed by combining old terms together in new ways. A new term T is imagined by means of two or more existing terms T1, T2…. We would call term T realistic, if all the terms (T1, T2…) constituting it are realistic and their combination is credible. But if all the terms on which T is based are realistic, but their combination is not credible (e.g. we know that no T1 is T2, so the conjunction T1 + T2 is contrary to fact), we would call T unrealistic; and of course, if one or more of the terms constituting T is/are unrealistic, we would call T unrealistic. If T is made up of hypothetical elements or if its elements are realistic but their combination is of uncertain status, we would call T hypothetical.

Now, our thinking in practice is aimed at knowledge of reality. That is to say, when we come across a term without existential import, i.e. when we decide that a term is unrealistic, whether because it goes against our empirical observations or because it is in some way illogical—*we normally lose interest in it and*

drop it. We certainly do not waste our time wondering whether such a subject has or lacks some predicate, since obviously if the subject is non-existent it *has no* predicates anyway. If we regard a term as empty, the oppositions of its various quantities and polarities in relation to whatever predicate are henceforth totally irrelevant. An empty term, once established as such, or at least considered to be such, plays no further role in the pursuit of knowledge. This attitude is plain common-sense, except perhaps for lunatics of various sorts. For this reason, the oppositions between propositions involving empty terms are *trivial*. That is, the above detailed non-Aristotelian models of opposition are insignificant.

The net effect of the successive 'dilutions' is to make the strong, Aristotelian rectangle of oppositions (concerning propositions with existential import) seem like a special case of little importance, and to give the weaker, non-Aristotelian rectangles (concerning variously empty propositions) a disproportional appearance of importance. The reason why this occurs is that the weaker oppositions represent the lowest common denominator between the Aristotelian and non-Aristotelian oppositions, which we need if we want to simultaneously discuss propositions with and without existential import. But the result is silly, for the Aristotelian diagram (36.1) is the important one, teaching us to think straight, whereas the non-Aristotelian ones are really of very minimal and tangential academic interest.

Practical logic is focused on terms that are believed to be realistic or at least hypothetical – it is not essentially concerned with empty terms. Contrary to the accusations made by modern logicians, Aristotelian logic is not only concerned with realistic terms. It is in fact mainly used with hypothetical terms, since (as already pointed out) most of the terms which furnish our thoughts are hypothetical – tentative constructs in an ongoing inductive enterprise. We do not think hypothetical thoughts by means of some special logic – we use the same old Aristotelian logic for them. That is to say, *in accord with* **the principle of induction**, *we treat a hypothetical term as a realistic term until and unless we have reason to believe otherwise*.

The reason we do so is that a hypothetical term, i.e. one not yet proved to be realistic or unrealistic, is a candidate for the status

of realism. This being the case, we treat it as we would any realistic term, subjecting it to the strong, Aristotelian model of oppositions, rather than to any watered-down model with wider aspirations, in the way of an inductive test. If the hypothetical term is indeed deserving of realistic status, it will survive the trial; if, on the other hand, it does not deserve such status, it will hopefully eventually be found to lead to contradiction of some sort. In that event, we would decide that the hypothetical term should rather be classed as an unrealistic term, and we would naturally soon lose interest in it. Thus, there is only one significant and useful model for oppositions between propositions, namely the Aristotelian one.

Indeed, we sometimes use Aristotelian logic even for unrealistic terms. Very often, we remove the stigma of unrealism by rephrasing our statement more precisely[222]. Alternatively, we might just keep the imaginary intent in mind: say a novelist wishes to write about fictional people, or even science-fiction creatures, he would not logically treat his subjects as empty terms – but rather subject them to the logic applicable to realistic terms, so as to enhance the illusion of realism in his novel. Thus, the logic applicable to empty terms which we have above investigated is in practice never used.

Whatever the alleged existential import of the terms involved, our thoughts remain guided by the demanding model of

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222 For example, we might say (instead of "unicorns are horses with a horn") "the imaginary entities called unicorns look like horses with a horn on their forehead" or (instead of "some unicorns are white, some black") "some of the unicorn illustrations I have seen involve a white horse, but some involve a black one," Note that *both* the initial propositions (given in brackets) have empty terms, even though one is general and the other is particular. Clearly, after such corrective rephrasing the two propositions do have existential import, although they do so with reference to imaginary (mental) entities rather than to real (physical) ones. Consequently, while the initial propositions cannot be said to be true, the more precise ones replacing them can be said to be true, and we can apply Aristotelian logic to them without qualms. Note also in passing that even a seemingly eternally imaginary entity may one day become real – for example, we might by artificial selection or by some genetic manipulation one day produce real unicorns.

Aristotelian oppositions. The rational pursuit of knowledge still indubitably *requires* the clear-cut logic of Aristotle enshrined in the traditional rectangle of oppositions (diagram 36.1). The reason why Aristotle took the existential import of the subjects of categorical propositions for granted is, I suggest, because *naturally, if there is nothing (i.e. no subject) to talk about (i.e. to predicate something of) we will not talk about it; and if we are talking, then that presumably means we do have something to talk about, i.e. a subject as well as a (positive or negative) predicate*. This is manifest common-sense.

If Aristotle – as far as we know, or at least as far as readers of his extant works have so far managed to discern, or so we are told by historians of logic – did not ask the question regarding the existence of the subject, it is probably simply because he quite intelligently had no interest in empty subjects. He was rightly focused on the pursuit of knowledge of the world facing him, not some non-existent domain. Modern logicians are rather, I suggest, more intent on impressing the yokels with their intellectual brilliance. With that overriding purpose in mind, they fashion systems of no practical significance whatever. They make mountains out of molehills, presenting trivia as crucial discoveries, so as to draw attention to their own persons.

6. Further Criticism

Modern logic is a complex web of static relationships, most of them irrelevant. It ignores the dynamics of human thinking, the fact that our knowledge is constantly in flux. It is, we might say, a science of space irrespective of time. In an effort, on the surface praiseworthy, to formally acknowledge the issue of existential import, it gives undue attention to empty terms, elevating them from a very marginal problem to a central consideration. Instead of dealing with existential import parenthetically, as a side issue, it erects a logical system that effectively shunts aside some of the most important logical processes in the human cognitive arsenal.

The traditional universal propositions are cognitively of great importance. They cannot just be discarded, as modern logic has

tried doing under the pretext that formal logic had to be expanded to include consideration of counterfactual terms. There are logical processes involving these propositional forms that are of great practical importance, and which logic must focus on and emphasize. It is absurd to henceforth effectively ignore these venerable and indispensable forms while making a big thing of a theoretical consideration of no practical significance whatever. The universals A and E cannot be retired under any pretext; they are not mere conventional conjunctions of more primitive forms.

For a start, universal propositions are essential to the crucial logical processes of *subsumption and non-subsumption*, which are enshrined in Aristotle's syllogistic. First figure syllogisms serve to include an instance in a class or a subclass in a wider class; they teach us the notion that 'all X' includes every individual 'this X' and any possible set of 'some X'. If, instead of an argument such as "All X are P and this S is X, therefore this S is P" (1/ARR) we propose the modern major premise "Nothing is X and not-P," with the same minor premise, we obviously (even though the minor premise implies the existential import of an X) *can no longer directly draw the desired conclusion*! We are forced to stop and think about it, and infer that "this S is not not-P" before concluding that "this S is P." Similarly, second figure syllogisms serve to exclude an instance from a class or a subclass from a wider class, and third figure syllogisms to identify overlaps between classes; and the moods of these figures become inhibited or greatly distorted if universal propositions are reinterpreted as modern logicians suggest.

Again, universal propositions are essential to the crucial logical processes of *generalization and particularization*. If 'this X' and 'some X' are not implied by 'all X', then we cannot generalize from the former to the latter. Of course, given 'this X' or 'some X', we do have existential import, and thus can anyway generalize to 'all X'. But the fact remains that if, in accord with modern logic, we conceive our generalization as a movement of thought from "This/Some X is/are Y" to "Nothing is X and not-Y," we miss the point entirely, even if admittedly the existential import of X is implied by the premise. For in such case, *the formal continuity between premise and conclusion is lost*, there

being two inexplicable changes of polarity (from something to nothing and from Y to not-Y)! Similarly, particularization requires formal continuity. To move freely from I to A, and then possibly to IO, we need the traditional opposition (contradiction) between A and O.

Another issue that is ignored by modern logicians is *modality*. Although modern logic has developed modal logic to some extent, it has done so by means of symbolic notations based on very simplistic analyses of modality. Although it has conventionally identified the different categories of modality (necessity, impossibility, actuality, inactuality, possibility, unnecessity), it has not thoroughly understood them. It has not clearly identified and assimilated the different types of modality (the logical, extensional, natural, temporal, and spatial modes), even if human discourse has included them all since time immemorial. Notably lacking in its treatment is the awareness that modality is an expression of conditioning and that the different types of modality give rise to different types of conditioning.

Consideration of modality is manifestly absent in the doctrine of existential import. The latter (as we saw) is built around the timeless (or 'omnitemporal') forms of categorical proposition, which are non-modal. It does not apply to modal categorical propositions, *for these do not formally imply (or presuppose) the actuality of their subject but only its possibility*. Thus, a universal proposition with natural-modality, "All S can (or must) be P," does not formally imply that "Some things *are* S" but only that "Some things *can be* S;" likewise, one with temporal modality, "All S are sometimes (or always) P" does not imply that "Some things *are* S" but only that "Some things *are sometimes* S;" and so forth.

This may be called 'existential import' in a broadened sense, acknowledging that being has degrees; but it is certainly not the actual sense intended by modern logicians: they apparently imagine that use of such modal propositions implies belief that "Some things *are* S." And of course, the *modality of subsumption*, as I have called this phenomenon in my book *Future Logic* (chapter 41), is very relevant to the processes of opposition, eduction (immediate inferences), syllogistic

deduction (mediate inference) and induction. Regarding the latter, see my detailed theory of factorial induction in the said work. Thus, we may well say that the proponents of the doctrine of existential import constructed an expanded system of logic based on a rather narrow vision of the scope of logic. Even if their expansion (for all it is worth—not much, I'd say) is applicable to non-modal propositions, it is not appropriate for modal ones.

f. The critique of the Aristotelian rectangle of oppositions began apparently in the middle ages, with Peter Abelard (France, 1079-1142). According to the Kneales, further input on this issue was made over time by William of Shyreswood, by Peter of Spain and St. Vincent Ferrer, and by Leibniz. They also mention Boole's interest in it, and many people attribute the modern view of the issue to this 19th century logician. However, E. D. Buckner suggests that the modern idea stems rather from Franz Brentano (Austria, 1838-1917), in a paper published in 1874[223]. And of course, many big-name logicians such as Frege and Russell have weighed in since then.

Even though the new logic that ensued, based on the concept of existential import, is today strongly entrenched in academia, the switchover to it was epistemologically clearly not only unnecessary but ill-advised. The doctrine of existential import has been woefully misnamed: it is in fact *not* about existential import, but rather about *non*-existential import. It gives to empty terms undue importance, and thus greatly diminishes the real importance of non-empty terms. To be sure, this innovation fitted the anti-rational 'spirit of the times', and it kept many people happily busy for over a century, and thus feeling they existed and were important – but it was in truth emptiness and vanity.

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223 For Buckner's account of the history, see: www.logicmuseum.com/cantor/Eximport.htm. Notice his pretentious characterization of "the traditional 'syllogistic'" as "a historical curiosity." Brentano's position is to be found in his *Psychologie vom empirischen Standpunkt*, II, ch. 7. The Kneales do mention the latter reference in passing, in a footnote on p. 411.

Apparently, none of these people reflected on the obvious fact that once a term is identified as empty, it is simply dumped – it does not continue affecting our reasoning in any significant manner. This being so, there is no need to abandon the universal forms A and E because they imply (presuppose) the existential import of their subject. Even if the Aristotelian framework, which is built around non-empty terms, occasionally 'fails' due to the appearance of an empty term in discourse, such event is taken in stride and dealt with by summarily eliminating the discredited term thenceforth, and certainly *not* by switching to a non-Aristotelian framework as modern logicians recommend doing. In any case, the issue of existential import does not apply to modal logic, and so lacks generality.

Moreover, these people failed to realize that Aristotelian logical processing relates not only to realistic terms, but more significantly to hypothetical terms, i.e. *terms in process*. They viewed logic as a deductive activity; they did not realize its *essentially inductive* character. If, due to an immoderate interest in empty terms, the science of logic abandons the universal forms A and E, it deprives people of a language with which to accurately express the movements of thought inherent in the processes of syllogistic inference and of generalization and particularization. The science of logic must acknowledge the forms of actual human thinking, and not seek to impose artificial contraptions of no practical value. Otherwise, natural processes essential to human cognition cannot be credibly expressed and logic will seem obscure and arbitrary.

Modern logic has sown confusion in many people's minds, turning the West from a culture of confident reason to one of neurotic unreason. The purpose of logic studies ought to be to cognitively empower people, not incapacitate them. If logicians err in the forms of thought they describe and prescribe, they betray their mission, which is to intelligently and benevolently guide and improve human thinking. If they err, whether out of stupidity or malice, they turn logic from a responsible science and a fine art to a vain and dangerous game. They do not merely cease benefitting mankind; they positively harm people's minds.

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(The above list is not meant as a bibliography, but simply details the books referred to within the text.)

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Avi Sion is the author of several works on logic and philosophy: *Future Logic* (1990); *Judaic Logic* (1995); *Buddhist Illogic* (2002); *Phenomenology* (2003); *The Logic of Causation* (1999, 2003, 2010); *Volition and Allied Causal Concepts* (2004); *Ruminations* (2005); *Meditations* (2006); *Logical and Spiritual Reflections* (2008-9); *A Fortiori Logic* (2013).

These works can be freely studied at: www.TheLogician.net and www.AviSionBooks.com.

Inductive Logic (2018), can be read online at:
www.avisioninduction.bravesites.com.

A complete list of Avi Sion's websites can be viewed at:
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Avi Sion can be reached for questions or comments at:
avi-sion@thelogician.net